
Access Study to all Pertinent Parts of
Dam Projects During High Reservoir
Conditions

Naugatuck River Basin Connecticut

February 1989



**US Army Corps
of Engineers**

New England Division

ACCESS STUDY TO ALL PERTINENT PARTS OF
DAM PROJECTS DURING HIGH RESERVOIR CONDITIONS
NAUGATUCK RIVER BASIN
CONNECTICUT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

FEBRUARY 1989

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RESERVOIR CONDITIONS

NAUGATUCK RIVER BASIN
CONNECTICUT

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE NO.</u>
1. INTRODUCTION	
1.1 References	1
1.2 Authority	1
1.3 Purpose	1
1.4 Scope	1
2. GENERAL NOTES	2
3. DESIGN CRITERIA	2
4. CONCLUSIONS AND SUMMARY OF FINDINGS	
4.1 General	2
4.2 Black Rock Lake	2
4.3 East Branch Dam	2
4.4 Hall Meadow Brook Dam	3
4.5 Hancock Brook Lake	3
4.6 Hop Brook Lake	3
4.7 Northfield Brook Lake	3
4.8 Thomaston Dam	4
5. RECOMMENDATIONS	
5.1 General	4
5.2 Black Rock Lake	4
5.3 East Branch Dam	5
5.4 Hall Meadow Brook Dam	5
5.5 Hancock Brook Lake	5
5.6 Hop Brook Lake	5
5.7 Northfield Brook Lake	6
5.8 Thomaston Dam	6
5.9 Schedules and Funding	6

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
A-1	Black Rock Lake - General Plan
A-2	Black Rock Lake - Sections and Profile
B-1	East Branch Dam - General Plan
C-1	Hall Meadow Brook Dam - General Plan
C-2	Hall Meadow Brook Dam - Sections and Profile
D-1	Hancock Brook Lake - General Plan
D-2	Hancock Brook Lake - Profile, Sections, and Dike Plan
E-1	Hop Brook Lake - General Plan
E-2	Hop Brook Lake - Sections and Profile
F-1	Northfield Brook Lake - General Plan
F-2	Northfield Brook Lake - Sections and Profile
G-1	Thomaston Dam - General Plan
G-2	Thomaston Dam - Sections and Profile

APPENDICES

- A. Black Rock Lake
- B. East Branch Dam
- C. Hall Meadow Brook Dam
- D. Hancock Brook Lake
- E. Hop Brook Lake
- F. Northfield Brook Lake
- G. Thomaston Dam

1. INTRODUCTION

1.1 References:

a. ER 1130-2-419, Dam Operations Management Policy, dated 18 May 1978.

b. ER 1110-2-100, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures, dated 28 February 1983.

c. DAEN-ECE-B letter, subject: Trip Report - NED Office Visit and Damsite Inspections (22-25 October 1984) dated 5 November 1984.

1.2 Authority: As recommended in reference 1.1c, paragraph 4d (copy attached), a study program was initiated to review all of the Division projects to determine if adequate access is available to all pertinent parts of each dam project during high reservoir and emergency conditions.

1.3 Purpose: The purpose of this report is to evaluate existing access routes to pertinent parts of completed Corps of Engineers dams during high reservoir conditions in the Naugatuck River Basin and to make recommendations for improved access when adequate access is not available.

1.4 Scope: The following seven dam projects in the Naugatuck River Basin were investigated:

<u>Project</u>	<u>Location</u>
Black Rock Lake	Thomaston, CT
East Branch Dam	Torrington, CT
Hall Meadow Brook Dam	Torrington, CT
Hancock Brook Lake	Plymouth, CT
Hop Brook Lake	Middlebury, CT
Northfield Brook Lake	Thomaston, CT
Thomaston Dam	Thomaston, CT

Each project was reviewed to evaluate the adequacy of existing access routes to the embankment crests and downstream toes of the dam embankment and dikes as well as to the emergency spillway and outlet works. Determinations of adequacy of existing access during high reservoir and emergency conditions were made and recommendations for new access routes or improvements to existing access routes were provided where existing access was considered inadequate. In addition to having access to all pertinent features during high reservoir conditions, two general conditions were evaluated that would require emergency access: (1) uncontrolled seepage at the downstream toe of a dam or dike embankment and (2) failure of rock cut slopes causing blockage of spillway or outlet works channels. Of the two conditions, uncontrolled seepage at the downstream toe was considered to be the more severe as this would threaten the integrity of the dam while a channel blockage would only slow draw down efforts but not threaten the project structurally in most cases.

2. GENERAL NOTES

Sources of information used for this study include field notes and 35mm photographs taken during site visits conducted 16 through 18 May 1988, aerial photographs, information obtained from project managers and assistant project managers, relevant plans and design memoranda, and embankment performance during past high reservoir pool conditions.

3. DESIGN CRITERIA

The design criteria on which adequate access routes are based is a gravel road with a minimum of 12 inches of compacted gravel fill, and a 12 foot minimum width with grades not to exceed 12.5 percent. Vehicles expected to utilize emergency access routes include 10 cu. yd. dump trucks, backhoes, bulldozers, and medium sized truck mounted cranes. It is anticipated that cranes with boom lengths from 100 to 130 feet and a minimum working reach of 60 feet can be readily obtained for emergency work. Turning radii are held to a 50 foot minimum on a reduced slope where possible.

4. CONCLUSIONS AND SUMMARY OF FINDINGS

4.1 General: Existing emergency access to pertinent features of the studied projects were evaluated. Access to some features was found to be inadequate and the establishment of new access routes is recommended in Section 5 of this report and detailed in the pertinent project appendix. In some cases, existing access, although not meeting design criteria, was judged to be acceptable at this time based on the location of the subject feature relative to the reservoir pool at spillway crest, the extent and condition of existing access, the likelihood of a condition developing which would require emergency access, and other considerations. Therefore, recommendations for new routes to some features have not been made although existing access does not meet the stated design criteria.

4.2 Black Rock Lake: Existing access to the downstream toe is limited to the area between dam station 4+00 and station 10+90. During periods of high runoff, the seeded area at the toe of the dam throughout this reach is saturated making access difficult. Access to the outlet works was found to be inadequate and construction of an additional route to and across the downstream toe to the outlet works is recommended in Section 5 of this report and detailed in Appendix A. Access to the crest of the embankment is adequate. Access to the spillway and weir is limited to the reach of a crane positioned at the crest and the use of a road that crosses the spillway at the downstream end of the discharge channel but is considered adequate at this time.

4.3 East Branch Dam: Existing access to the downstream toe is marginal with access limited to the area between the left side of the outlet channel at station 6+70 and about station 7+20. The downstream toe, from 7+20 to the left abutment, is accessible only to light vehicles due to natural slopes up to 25%. Access to the downstream toe, from the spillway

channel to the right side of the outlet works can be achieved by the lowering of equipment down the face of the dam from the crest. Access to pertinent features of the project is considered adequate and no improvements to existing access routes or additional access routes are recommended at this time.

4.4 Hall Meadow Brook Dam: Ponded runoff at the downstream toe of the dam between Stations 4+40 and 6+50 limits access to the toe throughout this reach. The downstream toe of the dam between the left abutment and the outlet works at about station 9+00 is presently inaccessible other than by lowering equipment down the face of the dam embankment. Grades of approximately 35 percent prohibit the use of the downstream left abutment as an access route to the toe. Large trees within 15 feet of the downstream left abutment should be removed as part of normal operation and maintenance procedures to facilitate inspection. Access to the crest of the dam, outlet works, spillway channel, spillway weir, and crest of dike is considered adequate at this time. The downstream toe of the dike lies in a marsh and access to the toe is considered inadequate at this time. Recommendations for improved access to the downstream toes of the dam and dike are made in Section 5 of this report and detailed in Appendix C.

4.5 Hancock Brook Lake: Existing access to the downstream toe and outlet channel are considered inadequate due to the presence of ponded surface water as a result of the topography at the downstream toe. The extent of the ponding increases during periods of high runoff and isolates the outlet works and a portion of the downstream toe. Recommendations for improved access to the downstream toe and the outlet works is presented in Section 5 of this report and detailed in Appendix D. Existing access to all other pertinent features of the project are adequate at this time. However, the road on the crest of the dike is in poor condition and should be improved through normal project maintenance.

4.6 Hop Brook Lake: Access to the downstream toe of the dam is limited to the reach from station 5+30 to the left abutment. There is no existing access to the remainder of the toe. The crest of the dam and the intake tower are accessible from the service road on the crest of the dam and the service bridge. The intake channel, and the base of the intake tower are accessible from a berm across the upstream face of the embankment beginning at the end of the original Route 63 on the upstream side. Access to the dike is provided by a service road in good condition on the crest of the dike. The downstream toe of the dike can be reached from the crest but should be kept clear of vegetation through normal project maintenance for inspection purposes. Access to the spillway is provided by several gravel roads around the training dike in poor to fair condition and a flat seeded area that extends into the spillway. A proposed access route is presented in Appendix E which will improve access to the downstream toe of the dam embankment for inspection, emergency work, and proposed future remedial work.

4.7 Northfield Brook Lake: Access to the downstream toe is limited to the reach of the toe from the outlet works to the left abutment. This area is reached from the downstream section of the original Litchfield

Road. Access to the toe via Litchfield Road may be eliminated during spillway discharge for most construction equipment as this route passes through the spillway discharge channel. Depths of up to 1.1 feet with velocities up to 11 feet per second could be expected in the discharge channel at the crossing of Litchfield Road. The crest service road provides complete access to the crest and partial access to the spillway channel and the spillway weir. The outlet works has complete access via Litchfield Road and the open area at the downstream toe to the left of the outlet works during normal conditions. However, the outlet works may be inaccessible during spillway discharge due to the configuration of the access road and the spillway discharge channel. No recommendations for improved access are considered necessary at this time.

4.8 Thomaston Dam: Access to the outlet works is presently inadequate, and access to the downstream toe of the embankment is limited for all pool conditions. Access to all other pertinent features of the project is adequate. Recommendations to improve access to the outlet works and the downstream toe are presented in Section 5 of this report and detailed in Appendix G.

5. RECOMMENDATIONS:

5.1 General: Normal maintenance procedures to insure adequate emergency access include the clearing and removal of all vegetation and obstructions within 15 feet of the toes of all embankments, both upstream and downstream, as a means of access and to facilitate inspection during high pool conditions. These procedures should be followed at all projects. Additionally, all routes providing access to pertinent features of the projects should be kept clear. The project manager should bring to the attention of the Chief, Design and Facilities Evaluation Section, Geotechnical Engineering Branch, any deterioration of an emergency access route which may render a pertinent feature of the project inaccessible during high pool conditions. The following recommendations for each project studied are made to insure adequate emergency access. Details of recommended improvements to existing routes or recommended new routes are given in the respective appendices.

5.2 Black Rock Lake: A rock fill and gravel road meeting the design criteria should be constructed from the downstream side of the original Route 109 to the downstream toe of the dam and across the embankment slope to the outlet works, details of this recommended route are presented in Appendix A. The existing road from Black Rock State Park through the discharge channel to the outlet channel should be maintained through normal project maintenance and coordination with Black Rock State Park should be kept to insure that this route can be reached when required. The original Route 109 on the upstream side, which leads to a 15-foot wide berm extending to the base of the intake tower, should be maintained through normal project maintenance. As recommended above, a 15-foot wide strip should be kept clear of vegetation along the toes of the dam. Construction of the recommended route from the downstream end of the original Route 109 to the outlet works is given moderate priority.

5.3 East Branch Dam: No improvements to existing access or construction of additional access routes at East Branch Dam are recommended at this time. Continued normal maintenance procedures should keep emergency access routes in adequate condition. Should conditions change warranting improved access, recommendations will be made through Periodic Inspection Reports and improvements will be accomplished through the normal operation and maintenance program.

5.4 Hall Meadow Brook Dam: A rock fill berm should be constructed on the downstream face of the dam above an area of ponded runoff to allow for access over the reach from the right abutment to the outlet works. A rock fill road with a crushed stone surface should be constructed from the downstream toe at the right side of the outlet channel, above the outlet structure to the left side of the outlet channel to provide access to the reach of the downstream toe between the left abutment and the outlet works (see Plate No. C-1). A rock fill road along the downstream toe of the dike, from the existing access road at the north end to the spillway at the south end, should be constructed. This route will provide access over the entire length of the downstream toe and improve access to the left side of the spillway discharge channel which is presently accessible only to the extent of the reach of a crane positioned on the crest service road above the channel. Improvements to the existing haul road from Weigold Road to the north end of the dike should be performed through normal maintenance procedures. Construction of the recommended haul road along the downstream toe of the dike and improvements to the access road to the north end of the dike are given low priority. Construction of the rock fill berm at the downstream toe of the dam and construction of the access road to the downstream toe left of the outlet works is given moderate priority.

5.5 Hancock Brook Lake: A new access route extending from an existing gate on Waterbury Road across an open field to the downstream toe, across the downstream slope and parallel to the outlet channel should be constructed, (see Plate No. D-1). This road should be constructed of gravel fill from Waterbury Road to the toe of the dam and of rock fill with a crushed stone surface throughout the reach passing over the face of the dam, returning to a gravel surface along the outlet channel. This work is given moderate priority. The crest service road over the top of the dike is in poor condition with numerous depressions which puddle during storms. This road should be regraded, and material added as required to create a well drained stable surface. Work to be done to the crest service road of the dike is given low priority.

5.6 Hop Brook Lake: The proposed road presented in Appendix E should be constructed to gain access to the downstream toe of the dam which is presently inaccessible except by lowering equipment down the face of the dam. The access road is a gravel road from the rotary on the dam to the downstream toe adjacent to the outlet works (see Plate E-1). The construction of the road would require the excavation of a significant portion of the existing abandoned railroad embankment which lies roughly parallel to the dam embankment approximately 200 feet below the downstream toe. No improvements to existing access or new access routes to the spillway or the spillway training dike are recommended at this time.

Construction of the proposed downstream toe access route is given high priority as it will be required for proposed remedial measures to the downstream toe within the next two years.

5.7 Northfield Brook Lake: Although access to the downstream toe and the outlet works may be eliminated by spillway discharge over Litchfield Road, no improvements are recommended at this time based on the adequacy of access following spillway discharge and construction considerations. The possible access route investigated in Appendix F across the downstream face of the dam is not considered justified at this time.

5.8 Thomaston Dam: An existing gravel road, which leads from Blakeman Road to the downstream toe, should be improved over the reach from the spillway discharge channel to the downstream toe of the dam as shown on Plate No. G-1. The re-establishment of this route will provide access to the section of the downstream toe between the outlet works and the spillway during periods with no spillway discharge. During spillway discharge, this route will be cut off by flow through the spillway discharge channel. In addition to normal maintenance at the project, an existing access route from Route 8 to a U.S.G.S. gauge station along the right side of the outlet channel should be improved, as required to bring it up to the design criteria listed in Section 3 of this report. This route will provide access to the lower right side of the outlet channel. The rock cut right side of the outlet channel just below the outlet works is presently inaccessible. The construction of a gravel access road from an existing road downstream of the toe to the right side of the outlet channel as shown on Plate G-1 will provide the required access. Improvements to the gravel roads from the spillway discharge channel to the downstream toe and from Route 8 to the gauge station are given moderate priority. Construction of the proposed new access road to the right side of the outlet channel is given moderate priority.

5.9 Schedules and Funding: Recommendations assigned a high priority should be budgeted and implemented in the next two budget years (FY-91, FY-92), those items assigned a moderate priority should be budgeted within the next three years, and those with a low priority should be implemented within the next five years. Funds will be requested under normal operation and maintenance budgets for each project.

Summary of Recommendations and Costs

<u>Project</u>	<u>Access Feature</u>	<u>Recommended Priority</u>	<u>Est. Cost</u>
Black Rock Lake	Road to d/s toe and outlet works	Moderate	\$ 43,000
East Branch Dam	None	N/A	N/A
Hall Meadow Brook Dam	Improvements to haul road	Low	3,000
	Road at toe of dike	Low	47,000

Summary of Recommendations and Costs (Cont.)

<u>Project</u>	<u>Access Feature</u>	<u>Recommended Priority</u>	<u>Est. Cost</u>
Hall Meadow Brook Dam	Berm at toe of dam	Moderate	37,000
	Road to d/s toe left of outlet works	Moderate	25,000
Hancock Brook Lake	Road to d/s toe and outlet works	Low	25,000
Hop Brook Lake	Road to d/s toe	High (1)	343,000
Northfield Brook Lake	None	N/A	N/A
Thomaston Dam	Road to outlet works	Moderate	17,000
	Road improvements to toe of dam	Low	3,300

(1) The proposed access road to the downstream toe at Hop Brook Lake will be built with construction funds for remedial work to be done on the downstream slope of the dam.

APPENDIX A
BLACK ROCK LAKE

APPENDIX A
BLACK ROCK LAKE

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Subject</u>	<u>Page No.</u>
1.	A. Pertinent Data	A-1
	B. Access to Downstream Toe	
2.	Existing Access	A-2
3.	Adequacy of Access	A-2
4.	Recommended Improvements	A-2
	C. Access to Crest of Dam	
5.	Existing Access	A-2
6.	Adequacy of Access	A-2
7.	Recommended Improvements	A-2
	D. Access to Outlet Works - Channel and Tower	
8.	Existing Access	A-3
9.	Adequacy of Access	A-3
10.	Recommended Improvements	A-3
	E. Access to Spillway - Channel and Weir	
11.	Existing Access	A-3
12.	Adequacy of Access	A-3
13.	Recommended Improvements	A-3
	F. Cost Estimate	A-4

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
A-1	Black Rock Lake - General Plan
A-2	Black Rock Lake - Sections and Profile

APPENDIX A
BLACK ROCK LAKE

A. PERTINENT DATA

1. Pertinent Data.

LOCATION: Black Rock Lake is located on Branch Brook about 2 miles upstream from its confluence with the Naugatuck River in the towns of Thomaston and Watertown, Litchfield County, Connecticut.

CONSTRUCTION PERIOD: July 1967 through July 1971.

PURPOSE: The Black Rock Lake Project is an integral unit in the authorized plan for flood control along the Naugatuck River. Although not specifically authorized, recreational facilities have been provided and are maintained by the State of Connecticut.

RESERVOIR:

Drainage Area:	20.4 square miles		
Operating Levels:			
<u>Pool</u>	<u>Elevation</u>	<u>Area</u>	<u>Cumulative</u>
Invert	(NGVD) 410.0	(acres) —	Capacity (acre-feet) —
Recreation	437.0	21	305
Flood Control (Spillway Crest)	520.0	190	8,755

DAM:

Type:	Rolled Earthfill
Maximum Height (ft):	154
Length (ft):	933
Top Elevation (NGVD):	540

SPILLWAY:

Type:	Chute
Crest Length (ft):	140
Crest Elevation (NGVD):	520
Maximum Discharge Capacity (CFS):	33,500

OUTLET WORKS:

Type:	Rectangle
Size:	4 ft wide 5 ft high
Length (ft):	704
Gate:	2 hydraulic slide, 3'0" x 4'0"
Stilling Basin:	None

B. Access to Downstream Toe

2. Existing Access. The downstream toe from station 0+00 to the outlet works at station 4+00 is accessible only by lowering equipment down the downstream slope from the crest of the dam. The natural slope of the abutment over this reach is as steep as 55% in some areas. The downstream toe, from the outlet works to station 10+90, is currently accessible from a seeded area. During periods of high runoff, this area becomes saturated making access by heavy equipment difficult. From station 10+90 to station 12+00 at the left abutment, the area along the downstream toe is covered with vegetation which should be cleared 15 feet from the toe as part of normal maintenance.

3. Adequacy of Access. Based on the design criteria, existing access to the downstream toe is inadequate. Although there is limited access to the toe throughout the valley section, from the outlet works to station 10+90, during heavy runoff conditions this area may be saturated making access to this reach of the toe (and the outlet works) impossible.

4. Recommended Improvements. The downstream toe from station 0+00 to the outlet works is not accessible due to slopes of up to 55%, however, a 15-foot wide area should be maintained clear of vegetation for inspection purposes. Adequate access to the toe can be achieved by the construction of a gravel road from the original route 109, to the toe at about station 5+00 and across the downstream face of the dam to the outlet works. This access route should be constructed with a minimum of 12 inches of compacted gravel fill from the original route 109 to the downstream toe. The road should be constructed as a rock fill section with 3 inches of crushed stone on the surface from the downstream toe to the outlet works (see Plate No. A-2). Construction of this access route will be coordinated with recommendations for improved drainage and seepage monitoring at the downstream toe to include regrading and reseeding, reconstruction of drainage ditches, and clearing of vegetation throughout the area as outlined in Periodic Inspection Report No. 4, dated November 1988. Construction of this route is given moderate priority. Improvements for access to the downstream toe from station 10+90 to station 12+00 are not recommended due to numerous bedrock outcrops along this section of the toe, and abutment slopes of up to 25%.

C. Access to Crest of Dam

5. Existing Access. The crest of the dam embankment is traversed by a 20-foot wide paved road in good condition and is totally accessible during all pool conditions. Distress on the upstream slope during high water conditions must be serviced from the crest by a combination of dozers, cranes, and trucks.

6. Adequacy of Access. Existing access to the crest of the dam is considered adequate.

7. Recommended Improvements. No improvements to the existing crest access road or additional crest access routes are recommended at this time.

D. Access to Outlet Works - Channel and Tower.

8. Existing Access. Existing access to the intake channel is achieved by a berm which runs along the upstream embankment of the dam from the original Route 109, however this berm is only accessible during low water conditions. During high water conditions the intake channel is inaccessible. The lower outlet channel is accessible by a gravel road which runs from Black Rock State Park to the outlet works. This road is in poor condition and is cut off by spillway discharge eliminating this access route during such conditions. The outlet channel and outlet structure is also accessible to light equipment by passing along the downstream toe from the original Route 109, however, this route becomes saturated making access difficult or impossible during periods of high runoff. The right side of the outlet channel is a high rock cut with the potential to block the channel and limit discharge capabilities. The control tower can be reached during all pool conditions via the service bridge which extends from the crest service road to the tower.

9. Adequacy of Access. Existing access to the intake and outlet channels during spillway discharge is inadequate. Emergency access to the intake tower is adequate for all pool conditions.

10. Recommended Improvements. Access to the intake channel during high water conditions is considered unnecessary. Access to the outlet channel and the outlet structure will be improved to an adequate condition by the construction of the access route recommended in paragraph 4 for access to the downstream toe. Completion of this access route to the left side of the outlet channel along with the existing road from Black Rock State Park will provide clearing capability throughout the rock cut portion of the outlet channel. Coordination should be maintained with Black Rock State Park to insure access to the existing gravel road leading from the park to the outlet channel. Additionally, the portion of this road which lies on Government Property should be improved and maintained as part of normal project operations. There are no improvements required for the intake tower.

E. Access to Spillway - Channel and Weir.

11. Existing Access. Access to the weir is limited to the reach of a crane positioned on the crest at the left side of the spillway. Access to the spillway channel is limited to lowering of a bulldozer into either the approach or discharge channel. The extreme lower end of the discharge channel can be reached using the existing gravel road from Black Rock State Park. A failure of the rock cut wall at the right side of the spillway channel would not significantly reduce the capacity of the spillway.

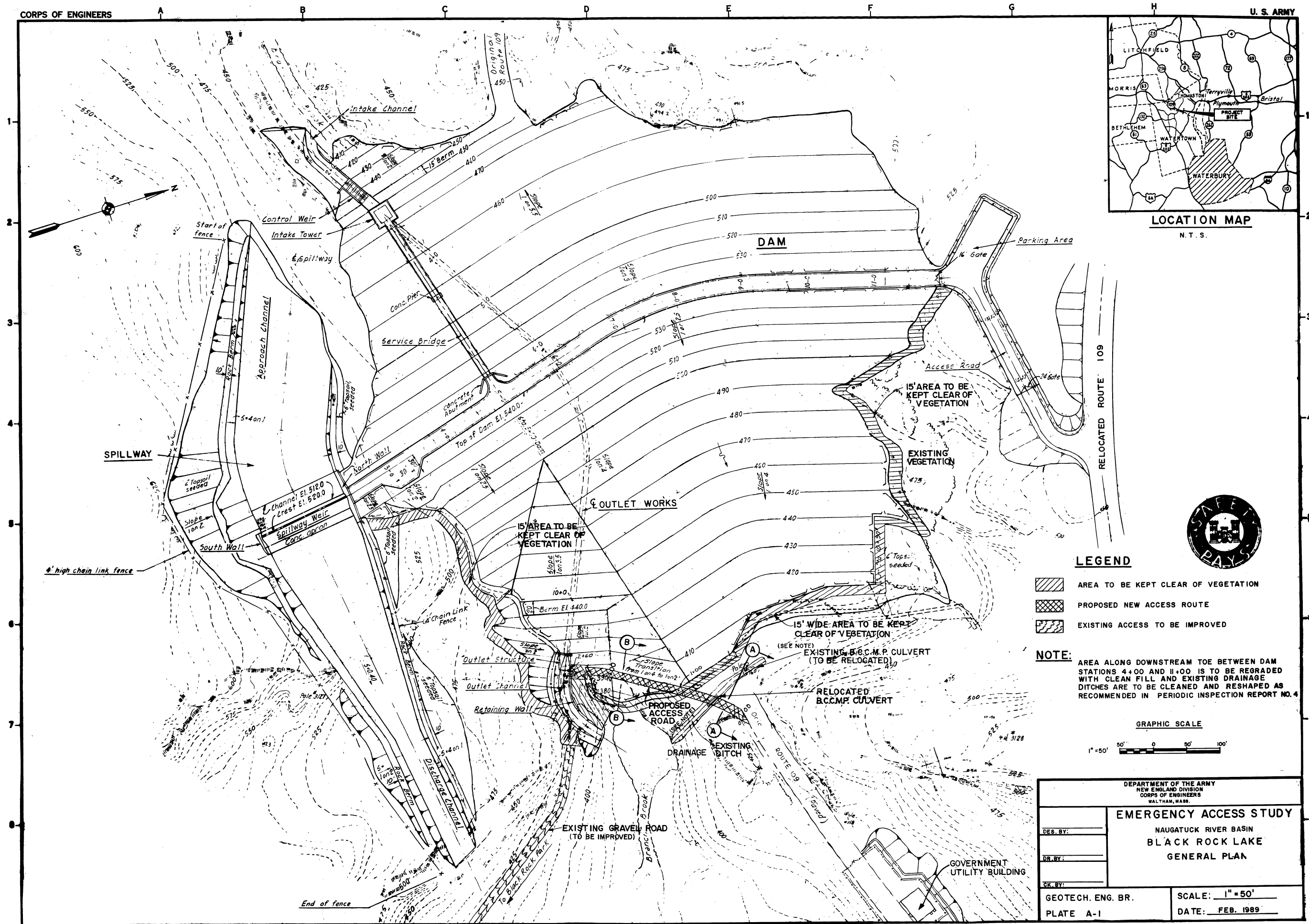
12. Adequacy of Access. Access to the spillway weir is considered marginal at this time based on the width of the channel relative to the depth of the rock cut along the right side.

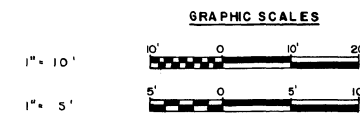
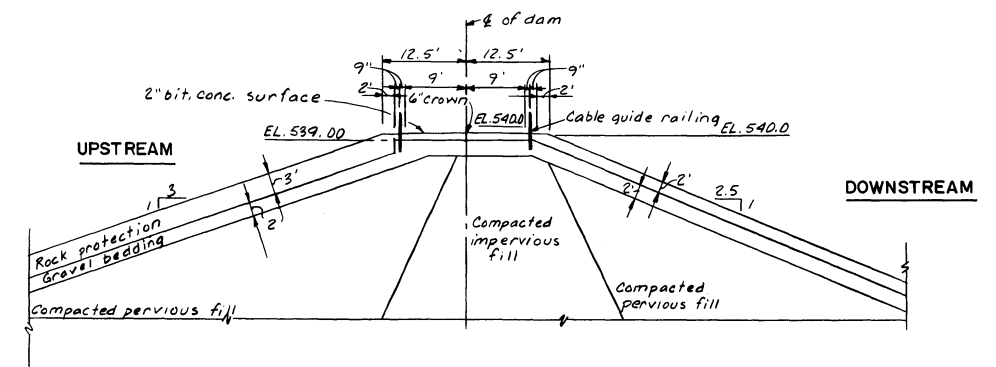
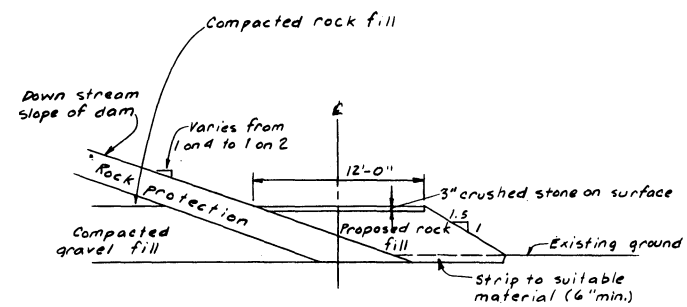
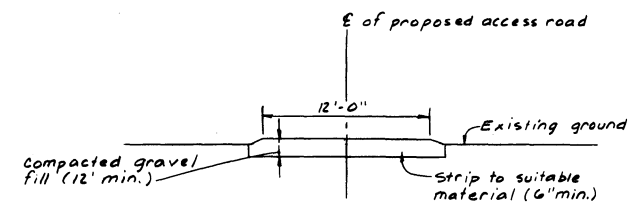
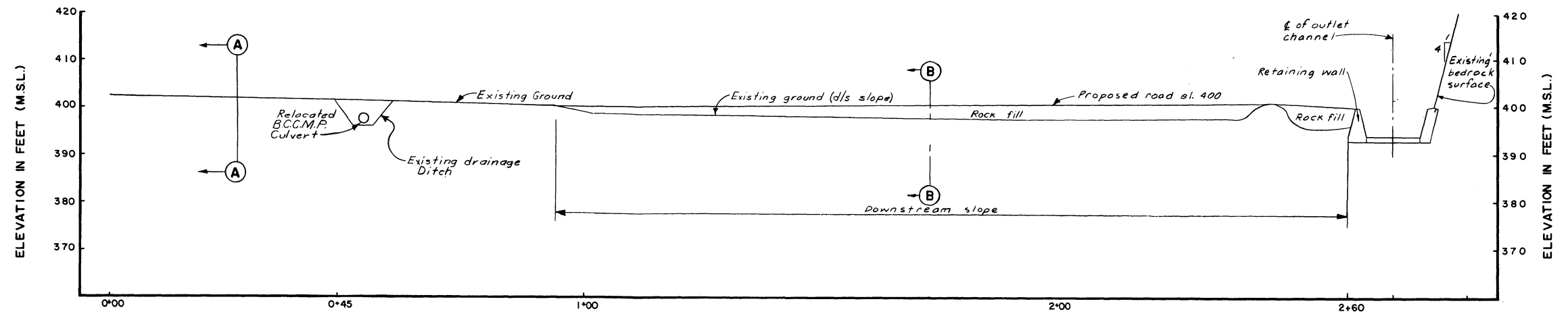
13. Recommended Improvements. No improvements to the existing access or new access routes to the spillway and weir are recommended at this time.

F. Cost Estimate

Access Road: Downstream Toe of Dam and Outlet Works:

<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	Job	LS	2,000.00
Stripping	15	cu. yd.	10.00	150.00
Gravel Fill	25	cu. yd.	20.00	500.00
Crushed Stone	45	cu. yd.	25.00	1,125.00
Rock Fill	785	cu. yd.	45.00	<u>35,325.00</u>
			Subtotal	39,100.00
			Contingency 10%	<u>3,910.00</u>
			TOTAL	43,010.00
			SAY	43,000.00





DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
EMERGENCY ACCESS STUDY	
DES. BY:	NAUGATUCK RIVER BASIN
DR. BY:	BLACK ROCK DAM
CK. BY:	SECTIONS AND PROFILES
GEO TECH. ENG. BR.	SCALE: AS SHOWN
PLATE A-2	DATE: FEB. 1989

APPENDIX B

EAST BRANCH DAM

APPENDIX B
EAST BRANCH DAM

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Subject</u>	<u>Page No.</u>
1.	A. Pertinent Data	B-1
	B. Access to Downstream Toe	
2.	Existing Access	B-2
3.	Adequacy of Access	B-2
4.	Recommended Improvements	B-2
	C. Access to Crest of Dam	
5.	Existing Access	B-2
6.	Adequacy of Access	B-2
7.	Recommended Improvements	B-2
	D. Access to Outlet Works	
8.	Existing Access	B-2
9.	Adequacy of Access	B-2
10.	Recommended Improvements	B-2
	E. Access to Spillway - Channel and Weir	
11.	Existing Access	B-3
12.	Adequacy of Access	B-3
13.	Recommended Improvements	B-3

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
B-1	East Branch - General Plan

APPENDIX B
EAST BRANCH DAM

A. PERTINENT DATA

1. Pertinent Data.

LOCATION: The project is located in the city of Torrington, Litchfield County, Connecticut on the east branch of the Naugatuck River, three miles above its confluence with the west branch. East Branch Dam is owned and operated by the State of Connecticut.

CONSTRUCTION PERIOD: March 1963 through June 1964.

PURPOSE: The project forms part of the comprehensive plan of protection in the Naugatuck Valley and contributes to flood stage reduction at Torrington and downstream damage centers.

RESERVOIR:

Drainage Area:	9.3 square miles		
Operating Levels:			
<u>Pool</u>	<u>Elevation</u> <u>(NGVD)</u>	<u>Area</u> <u>(acres)</u>	<u>Capacity</u> <u>(acre-feet)</u>
Inlet	795.0	—	—
Flood Control (Spillway Crest)	865.0	158	4,350

DAM:

Type:	Rolled earthfill
Maximum Height (ft):	92
Length (ft):	700
Top Elevation (NGVD):	881.0

SPILLWAY:

Location:	Right (west) abutment
Type:	Uncontrolled, ogee weir and chute in rock
Crest Length (ft):	100
Crest Elevation (NGVD):	865.0
Maximum Discharge Capacity (CFS):	14,300

OUTLET WORKS:

Type:	Circular concrete conduit
Size:	3-foot inside diameter
Length (ft):	450
Gates:	Ungated
Discharge at Spillway Crest (CFS):	225
Stilling Basin:	25' x 12' wide, baffle blocks and end still

B. Access to Downstream Toe of Dam

2. Existing Access. Direct access to the downstream toe is limited to a reach from the outlet works at station 6+70 to station 7+20 via a gravel parking area at the end of the original Newfield Road. The toe from Station 7+20 to the left abutment is limited to access by light equipment due to slopes of up to 25%. The toe from the right abutment at the left side of the spillway to the outlet works at station 6+70 is accessible to emergency equipment only by lowering the equipment down the face of the embankment.

3. Adequacy of Access. Access to the toe of the dam is considered adequate at this time.

4. Recommended Improvements. No improvements to existing access or additional access routes to the downstream toe are recommended at this time. Normal maintenance procedures should continue to be followed.

C. Access to Crest of Dam

5. Existing Access. Access to the crest of the dam is achieved by the existing gravel service road which extends across the length of the crest. The upper portion of the upstream slope may be reached from the crest service road. During low water conditions, the upstream slope may be reached via the upstream portion of the original Newfield Road.

6. Adequacy of Access. Access to crest of the dam and the upstream slope is considered adequate at this time.

7. Recommended Improvements. No improvements to the existing access or additional access routes to the crest of the dam are recommended at this time.

D. Access to Outlet Works

8. Existing Access. Access to the outlet structure and the outlet channel is by a gravel parking area at the downstream toe which is reached from the downstream end of the original Newfield Road. Access to the inlet channel and the intake structure is by an open area at the upstream toe which is reached from the upstream portion of the original Newfield Road. The inlet channel and the intake structure can only be reached during periods of low water. There is no control tower at this project.

9. Adequacy of Access. Access to both channels of the outlet works and the outlet structure is considered adequate at this time.

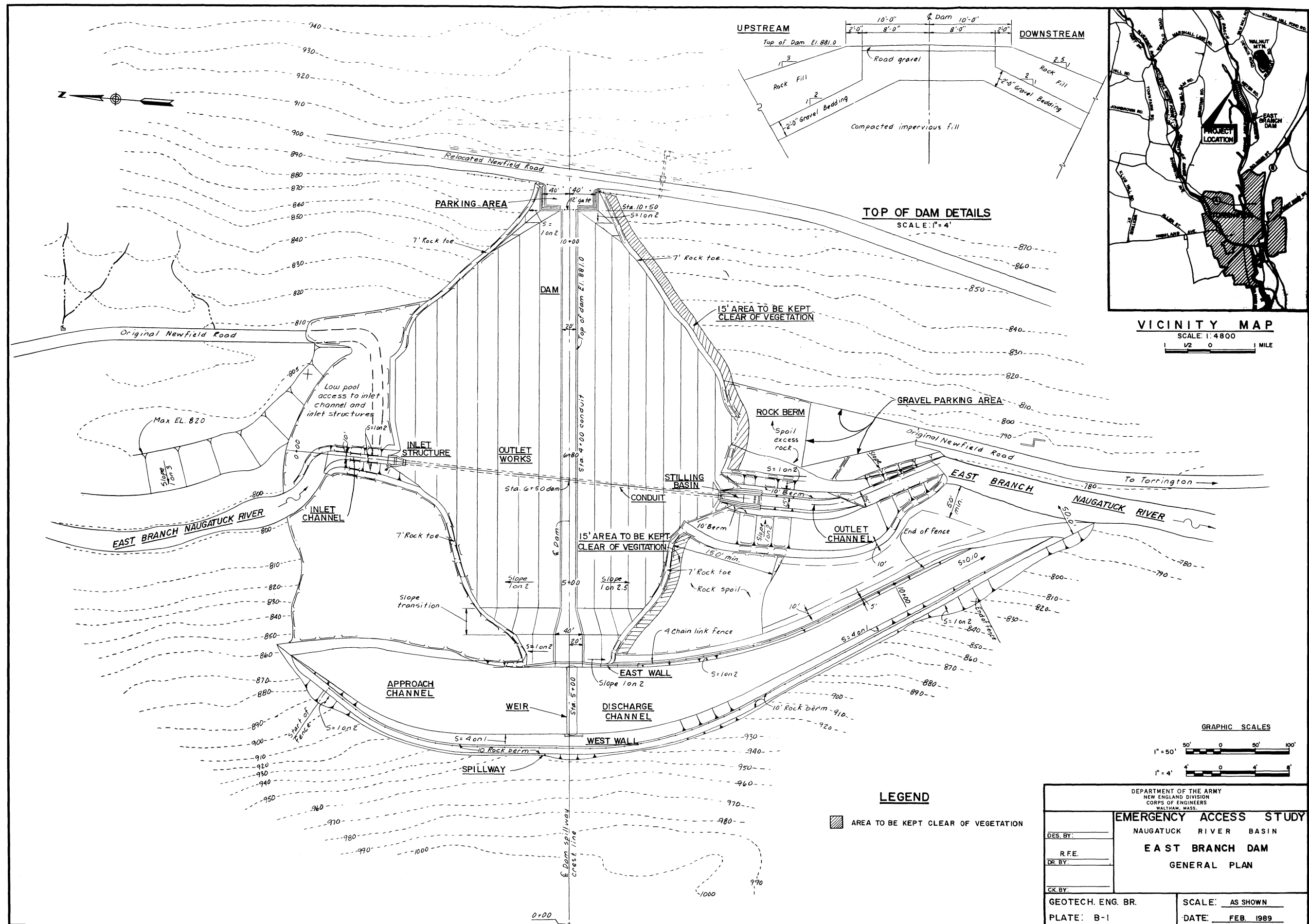
10. Recommended Improvements. No improvements to the existing access or additional access routes to the outlet works are recommended at this time.

E. Access to Spillway - Channel and Weir

11. Existing Access. Access to the spillway and weir is limited to the reach of a crane positioned on the crest of the dam at the left side of the spillway. During periods without spillway discharge, a dozer can be lowered into the spillway to work in conjunction with a crane positioned on the crest. It is believed that a failure of the rock cut wall along the right side of the spillway would not significantly reduce the capacity of the spillway.

12. Adequacy of Access. Access to the spillway works is considered adequate at this time.

13. Recommended Improvements. No improvements to the existing access or additional access routes to the spillway works are recommended at this time.



APPENDIX C

HALL MEADOW BROOK DAM

APPENDIX C
HALL MEADOW BROOK DAM

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Subject</u>	<u>Page No.</u>
1.	A. Pertinent Data	C-1
	B. Access to Downstream Toe	
2.	Existing Access	C-2
3.	Adequacy of Access	C-2
4.	Recommended Improvements	C-2
	C. Access to Crest of Dam	
5.	Existing Access	C-3
6.	Adequacy of Access	C-3
7.	Recommended Improvements	C-3
	D. Access to Outlet Works	
8.	Existing Access	C-3
9.	Adequacy of Access	C-3
10.	Recommended Improvements	C-3
	E. Access to Spillway - Channel and Weir	
11.	Existing Access	C-3
12.	Adequacy of Access	C-3
13.	Recommended Improvements	C-3
	F. Access to Dike - Downstream Toe and Crest	
14.	Existing Access	C-4
15.	Adequacy of access	C-4
16.	Recommended Improvements	C-4
	G. Cost Estimate	C-4

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
C-1	Hall Meadow Brook Dam - General Plan
C-2	Hall Meadow Brook Dam - Sections and Profile

APPENDIX C
HALL MEADOW BROOK DAM

A. PERTINENT DATA

1. Pertinent Data.

LOCATION: The project is located in the city of Torrington and the town of Goshen in Litchfield County, Connecticut. The project is located on Hall Meadow Brook, about 0.4 miles above its confluence with Hart Brook, where the two join to form the West Branch of the Naugatuck River. Hall Meadow Brook Dam is owned and operated by the State of Connecticut.

CONSTRUCTION PERIOD: March 1961 through June 1962.

PURPOSE: The project is a unit of a coordinated system of reservoirs for flood control in the Naugatuck Valley. Recreation facilities are also provided.

RESERVOIR:

Drainage Area: 17.2 square miles
Operating Levels:

<u>Pool</u>	<u>Elevation (NGVD)</u>	<u>Area (acres)</u>	<u>Capacity (acre-feet)</u>
Inlet	850.0	—	—
Flood Control (Spillway Crest)	898.0	372	8,620

DAM:

Type:	Rolled earthfill, rock slope protection, impervious core
Maximum Height (ft):	73
Length (ft):	1,200
Top Elevation (NGVD):	917.0

SPILLWAY:

Location:	Right (west) abutment of dike
Type:	Uncontrolled, ogee weir and chute in rock
Crest Length (ft):	100
Crest Elevation (NGVD):	898.0
Maximum Discharge Capacity (CFS):	19,200

OUTLET WORKS:

Type:	Circular concrete conduit
Size:	4-foot inside diameter
Length (ft):	315
Gates:	Ungated
Discharge at Spillway Crest (CFS):	455
Stilling Basin:	Bedrock channel

REUBEN HART RESERVOIR DIVERSION:

Location:	Reuben Hart Reservoir is owned and operated by Torrington Water Co. with the dam located on Hart Brook adjacent to the Hall Meadow Project. Flood flows from Reuben Hart drainage area are diverted to the Hall Meadow Reservoir by means of a diversion canal and spillway.
Type:	Uncontrolled, ogee weir and chute spillway in rock
Crest Length:	125
Crest Elevation:	911.00
Design Discharge (CFS):	6,100

B. Access to Downstream Toe of Dam

2. Existing Access. The downstream toe from about station 6+50 to the outlet works at about station 8+65 can be reached from a cleared area starting at the original Route 72 on the downstream side of the dam. Surface runoff ponds at the downstream toe from about station 4+40 to about station 6+50 due to the topography in the area. This condition isolates the cleared area along the toe from the right abutment to about station 6+50. The toe from the outlet works to the left abutment is inaccessible other than by lowering equipment down the face of the dam. The downstream left abutment has slopes up to 50% and making this area of the toe inaccessible. The left downstream abutment toe is vegetated with trees and brush making inspection difficult.

3. Adequacy of Access. Access to the toe from about station 6+50 to the outlet works at about station 8+65 is adequate at this time. Access to the toe between the outlet works and the left abutment and from the right abutment to about station 6+50 is inadequate.

4. Recommended Improvements. A rock fill berm should be constructed along the downstream toe at elevation 875.0 MSL from station 6+90 to station 4+00 to allow access to the downstream toe at the right abutment from the original Route 72. A 12 foot wide rock fill access road with a crushed stone surface, approximately 200 feet in length, should be constructed to allow access to the downstream toe and spoil area between the left abutment and the outlet works from the downstream toe at the right side of the outlet works. The road should be constructed from the downstream toe at about station 8+00, across the downstream face of the dam above the outlet works to the downstream toe at about station 10+00. All vegetation along the downstream toe should be cleared to 15 feet from the toe, particularly along the downstream left abutment. Construction of the rock fill berm at the downstream toe of the dam is given low priority.

C. Access to Crest of Dam

5. Existing Access. A gravel crest service road in good condition traverses the crest of the dam. The upper portion of the upstream slope of the dam can be accessed by a crane working from the crest service road. The upstream slope can also be accessed from a 10 foot wide berm which runs along the face of the embankment at elevation 864.0 MSL which can be reached from the upstream portion of the original Route 72 during low pool conditions.

6. Adequacy of Access. Access to crest of the dam and upstream slope of dam is considered adequate at this time.

7. Recommended Improvements. No improvements to the existing access or additional access routes to the crest of the dam are recommended at this time.

D. Access to Outlet Works

8. Existing Access. The outlet channel and outlet structure can be reached from the original Route 72 on the downstream side of the dam which runs along the right side of the outlet channel. The inlet channel and intake structure are accessed during low pool conditions from a berm on the upstream slope of the dam which can be reached from the end of the original Route 72. The dam is unregulated, and has no control tower.

9. Adequacy of Access. Access to the inlet and outlet channels and structures is considered adequate at this time.

10. Recommended Improvements. No improvements to the existing access or additional access routes to the outlet works are recommended at this time.

E. Access to Spillway - Channel and Weir

11. Existing Access. The spillway approach channel can be directly accessed with the pool below elevation 880.0 MSL from a gravel access road from the crest of the dam. Access to the discharge channel and the approach channel during high pool conditions is limited to the reach of a crane positioned on the dike crest service road at the left side of the spillway (see Plate No. C-1). A dozer can be lowered into the discharge channel to work in conjunction with a crane on the crest once spillway discharge has subsided. It is not believed that a failure of the rock cut wall along the right side of the spillway would significantly reduce the capacity of the spillway.

12. Adequacy of Access. Access to the spillway channel and weir is considered adequate at this time.

13. Recommended Improvements. No improvements to the existing access or additional access routes to the spillway are recommended at this time.

F. Access to Dike - Downstream Toe and Crest.

14. Existing Access. Access to the crest of the dike is provided by a gravel crest service road in fair condition. The crest service road is reached via a haul road in poor condition which extends from Weigold Road to the crest of the dike (see Plate No. C-1). Access to the downstream toe is limited to the lowering of equipment down the face of the dike. The downstream toe has a 7-foot wide rock berm which is not wide enough to allow access by construction equipment. Portions of the downstream toe are inundated by water from an adjacent swamp especially during high runoff periods, and vegetation including trees to 18-inches are growing along the rock toe limiting access and making inspection difficult.

15. Adequacy of Access. Access to the crest of the dike is considered adequate at this time provided the haul road from Weigold Road is improved. Existing access to the downstream toe is inadequate.

16. Recommended Improvements. The existing haul road from Weigold Road to the crest of the dike is in poor condition and should be improved by regrading, addition of minor quantities of gravel fill where needed, removal of obstructions including down trees and other improvements to insure that the design vehicles can reach the dike crest service road. No improvements to the crest service road are recommended at this time. The 7-foot wide rock berm at the downstream toe should be extended to 12 feet and all vegetation within 15 feet of the toe of the berm should be cleared to facilitate inspection (see Plate No. C-2). At the spillway end of the dike, the access route along the downstream toe should turn away from the embankment and follow the left side of the spillway discharge channel to the crest of the dike as shown on Plate No. C-1. This alignment will also improve access to the left side of the spillway discharge channel which is presently inaccessible during spillway discharge. Improvements to the wood road from Weigold Road to the crest of the dike is given low priority. Construction of the downstream toe access route is given low priority.

G. Cost Estimates

Improvements to Existing Road from Weigold Road:

<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Clearing	1	JOB	LS	1,000.00
Gravel Fill	25	cu. yd.	20.00	500.00
Grading	1	JOB	LS	<u>1,000.00</u>
Subtotal				2,500.00
Contingency 10%				<u>250.00</u>
TOTAL				2,750.00
SAY				3,000.00

Note: It is anticipated that this work will be done by project personnel.

Access Road: Downstream Toe of Dike:

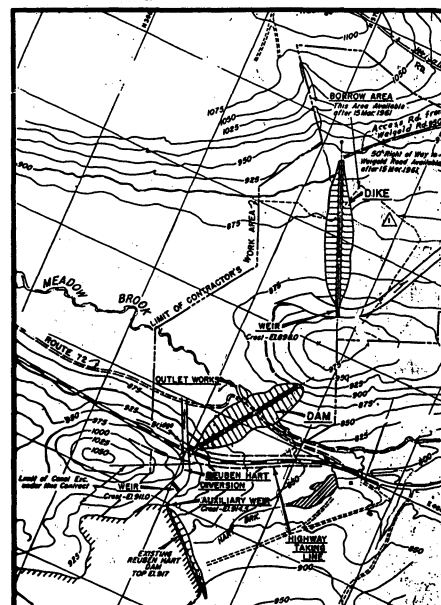
<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	JOB	LS	2,000.00
Stripping	230	cu. yd.	10.00	2,300.00
Gravel fill	125	cu. yd.	20.00	2,500.00
Crushed stone	275	cu. yd.	25.00	6,875.00
Rock Fill	650	cu. yd.	45.00	29,250.00
Subtotal				42,925.00
Contingency 10%				4,292.50
TOTAL				47,217.50
SAY				47,000.00

Rock Fill Berm: Downstream Toe of Dam:

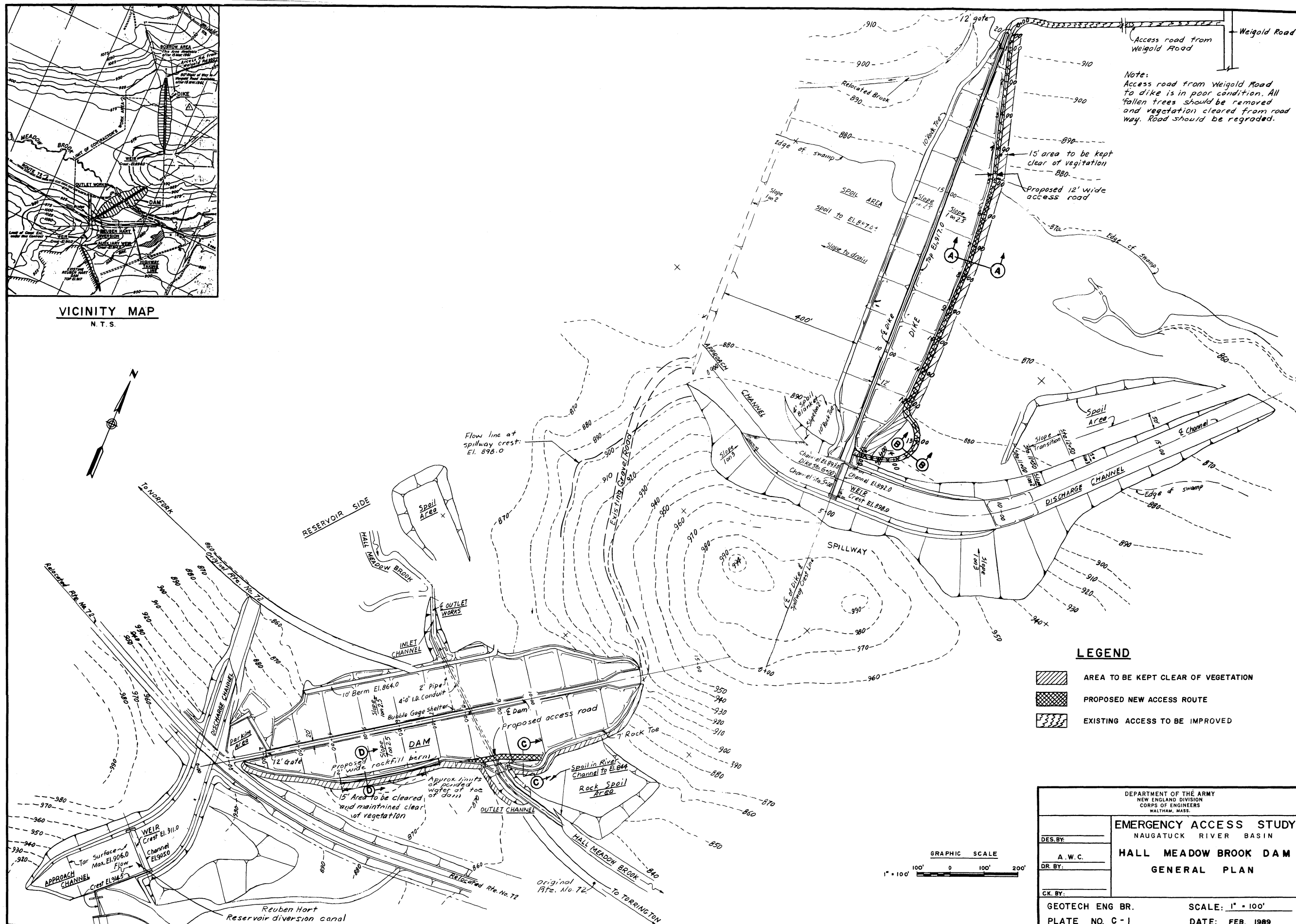
<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	JOB	LS	2,000.00
Stripping	125	cu. yd.	10.00	1,250.00
Rock Fill	645	cu. yd.	45.00	29,025.00
Crushed Stone	65	cu. yd.	25.00	1,625.00
Subtotal				33,900.00
Contingency 10%				3,390.00
TOTAL				37,290.00
SAY				37,000.00

Access Road to Downstream Toe Left of Outlet:

<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	JOB	LS	2,000.00
Rock Fill	450	cu. yd.	45.00	20,250.00
Crushed Stone	30	cu. yd.	25.00	750.00
Subtotal				23,000.00
Contingency 10%				2,300.00
TOTAL				25,300.00
SAY				25,000.00



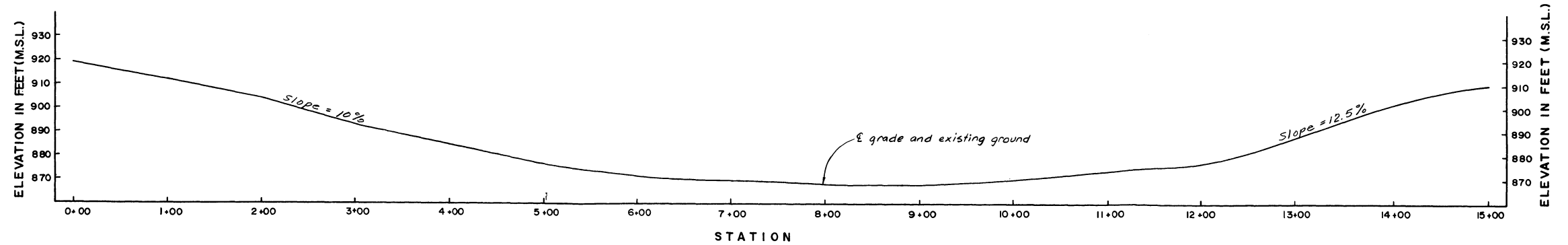
VICINITY MAP
N.T.S.



Note:
Access road from Weigold Road
to dike is in poor condition. All
fallen trees should be removed
and vegetation cleared from road
way. Road should be regraded.

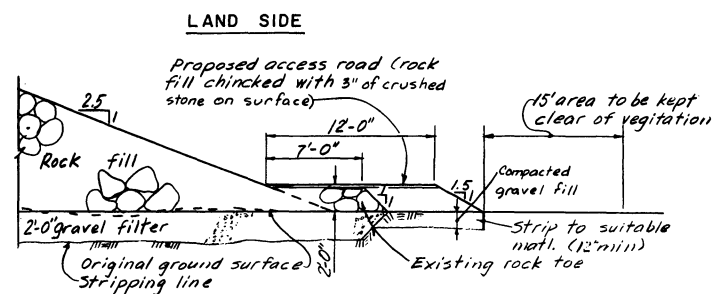
- LEGEND**
- AREA TO BE KEPT CLEAR OF VEGETATION
 - PROPOSED NEW ACCESS ROUTE
 - EXISTING ACCESS TO BE IMPROVED

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
EMERGENCY ACCESS STUDY NAUGATUCK RIVER BASIN	
HALL MEADOW BROOK DAM GENERAL PLAN	
DES. BY:	A.W.C.
DR. BY:	
CK. BY:	
GEOTECH ENG. BR.	SCALE: 1" = 100'
PLATE NO. C-1	DATE: FEB. 1989



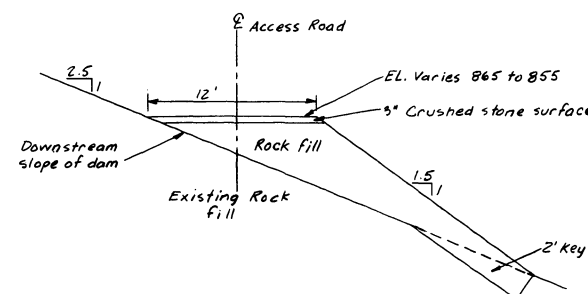
PROFILE - PROPOSED ACCESS ROAD AT TOE OF DIKE

SCALES: HOR. 1" = 50'
VERT. 1" = 20'



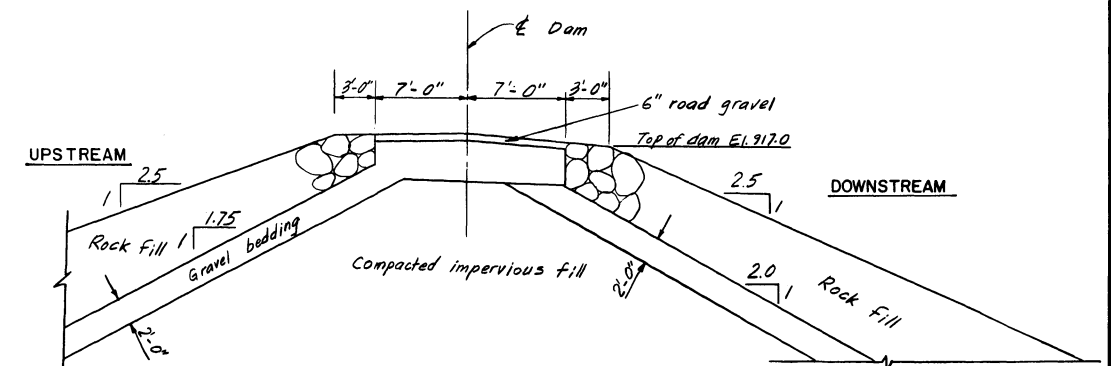
SECTION A-A
ACCESS ROAD ALONG DIKE (STA. 0+00 TO 12+00)

SCALE: 1" = 5'



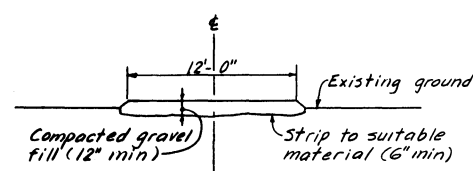
SECTION C-C
ACCESS ROAD ACROSS DOWNSTREAM
SLOPE OF DAM (STA. 8+00 TO 10+00)

SCALE: 1" = 5'



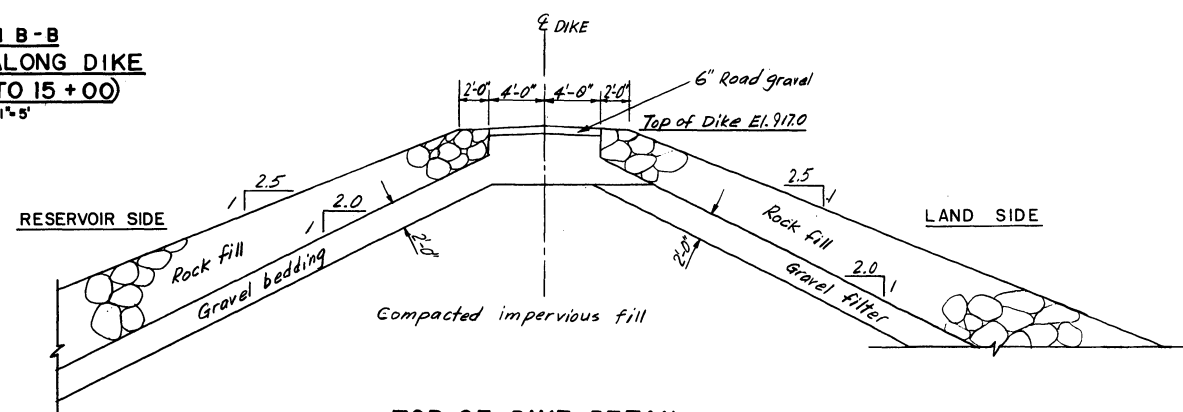
TOP OF DAM DETAIL

SCALE: 1" = 5'



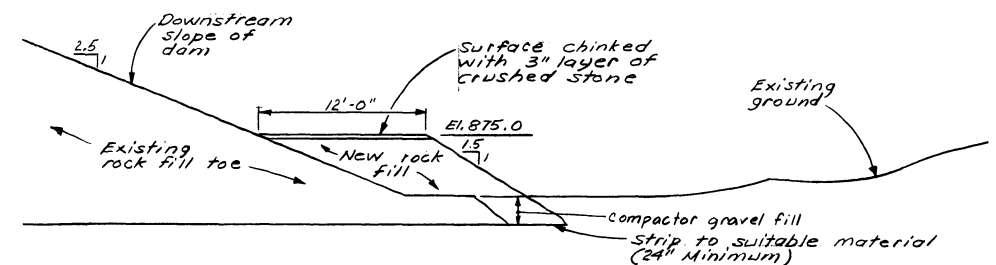
SECTION B-B
ACCESS ROAD ALONG DIKE
(STA. 12+00 TO 15+00)

SCALE: 1" = 5'



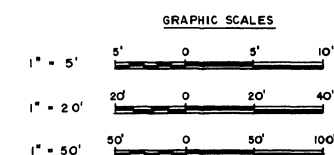
TOP OF DIKE DETAIL

SCALE: 1" = 5'



PROPOSED ROCK FILL BERM AT TOE OF DAM (STA. 4+00 TO 6+90)

SCALE: 1" = 5'



DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
DES. BY: _____	EMERGENCY ACCESS STUDY NAUGATUCK RIVER BASIN HALL MEADOW BROOK DAM SECTIONS AND PROFILE
A. W. C.	
DR. BY: _____	
CK. BY: _____	
GEOTECH. ENG. BR.	SCALE: AS SHOWN
PLATE: C - 2	DATE: FEB. 1989

APPENDIX D
HANCOCK BROOK LAKE

APPENDIX D
HANCOCK BROOK LAKE

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Subject</u>	<u>Page No.</u>
1.	A. Pertinent Data	D-1
	B. Access to Downstream Toe	
2.	Existing Access	D-2
3.	Adequacy of Access	D-2
4.	Recommended Improvements	D-2
	C. Access to Crest of Dam	
5.	Existing Access	D-2
6.	Adequacy of Access	D-2
7.	Recommended Improvements	D-2
	D. Access to Outlet Works	
8.	Existing Access	D-3
9.	Adequacy of Access	D-3
10.	Recommended Improvements	D-3
	E. Access to Spillway - Channel and Weir	
11.	Existing Access	D-3
12.	Adequacy of Access	D-3
13.	Recommended Improvements	D-3
	F. Access to Dike - Downstream Toe and Crest	
14.	Existing Access	D-3
15.	Adequacy of Access	D-3
16.	Recommended Improvements	D-4
	G. Cost Estimate	D-4

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
D-1	Hancock Brook - General Plan
D-3	Hancock Brook - Profile, Sections, and Dike
Plan	

APPENDIX D
HANCOCK BROOK LAKE

A. PERTINENT DATA

1. Pertinent Data.

LOCATION: Hancock Brook Lake is located on Hancock Brook in the town of Plymouth, Litchfield County, Connecticut about 3.4 miles above its confluence with the Naugatuck River.

CONSTRUCTION PERIOD: July 1963 through August 1966.

PURPOSE: The project provides reservoir storage for flood control.

RESERVOIR:

Drainage Area:
Operating Levels:

12.0 square miles

<u>Pool</u>	<u>Elevation (NGVD)</u>	<u>Area (acres)</u>	<u>Capacity (acre-feet)</u>
Inlet	454.0	—	—
Flood Control (Spillway Crest)	484.0	266	4,030

DAM:

Type:	Rolled earthfill w/ rock slope protection
Maximum Height (ft):	57
Length (ft):	630
Top Elevation (NGVD):	505.0

SPILLWAY:

Location:	Right (west) abutment
Type:	Uncontrolled, ogee weir and chute in rock
Crest Length (ft):	100
Crest Elevation (NGVD):	484.0
Maximum Discharge Capacity (CFS):	16,600

OUTLET WORKS:

Type:	Rectangular concrete conduit
Size:	3' x 4.5'
Length (ft):	250
Gates:	Ungated
Discharge at Spillway Crest (CFS):	377
Stilling Basin:	Bedrock channel

B. Access to Downstream Toe of Dam

2. Existing Access. Access to the downstream toe is limited to an area between station 6+60 and 7+60. This area can be reached by crossing an open field from Waterbury Road to the toe of the dam. Groundwater ponds along the downstream toe between station 5+90 and station 6+60. This water is about three feet deep and usually extends to about 20 feet from the toe, however, during periods of heavy rainfall the dimensions increase. A drainage ditch which leads from this ponded water to the outlet channel isolates the toe between the outlet works at about station 4+90 and the water at the toe at about station 5+90. The downstream toe between the spillway and the outlet works can be reached only by lowering equipment down the face of the dam. Slopes on the downstream left abutment vary up to 50% limiting the type of equipment able to reach the toe along the abutment.

3. Adequacy of Access. Access to the downstream toe is considered to be inadequate between the outlet works and station 6+60 and from station 7+60 to the left abutment.

4. Recommended Improvements. For adequate access to the downstream toe a gravel road should be constructed from an existing gate at Waterbury Road to the toe at station 7+40. The access route should continue along the downstream face of the embankment above the ponded water at the toe as a rock fill section with a crushed stone surface. The access road should turn away from the dam at about dam station 5+15 and continue along the left side of the outlet channel as shown on Plate No. D-1. Construction of this route is given low priority. A 15 foot wide strip should be kept clear along the toe at the downstream left abutment and between the spillway and the outlet works for emergency equipment and inspection purposes.

C. Access to Crest of Dam

5. Existing Access. The crest of the dam embankment is traversed by a gravel service road in fair condition. The upper portion of the upstream slope can be reached by a crane on the crest service road as well as from a gravel service road which traverses the upstream slope from the left abutment to the intake structure. The upstream slope service road can only be used during low reservoir conditions.

6. Adequacy of Access. Access to crest and upstream slope of the dam is considered adequate at this time.

7. Recommended Improvements. No improvements to the existing access or additional access routes to the crest or upstream slope are recommended at this time.

D. Access to Outlet Works

8. Existing Access. The inlet channel and intake structure are accessed by the gravel service road from the parking area to the intake structure during low reservoir conditions. Due to an existing drainage ditch from the ponded water at the downstream toe to the outlet channel, the outlet channel and the outlet structure are not accessible. There is no control tower for the dam.

9. Adequacy of Access. Access to the inlet channel and intake structure is considered adequate. Access to the outlet works is considered inadequate due to the drainage ditch which lies between the outlet channel and Waterbury Road.

10. Recommended Improvements. Construction of the recommended downstream toe access route along the left side of the outlet channel will provide adequate access to the outlet channel and the outlet structure (see Plate No. D-1). No improvements to the existing access or additional access routes to the inlet channel and intake structure are recommended at this time.

E. Access to Spillway Channel and Weir

11. Existing Access. Access to the weir is limited to the reach of a crane positioned on the crest service road at the left side of the spillway. If required, a dozer can be lowered into the spillway to work in conjunction with a crane on the crest of the dam after spillway discharge has stopped. A failure of the rock cut walls at either side of the spillway will not significantly reduce the capacity of the spillway.

12. Adequacy of Access. Access to the spillway and weir is considered adequate at this time.

13. Recommended Improvements. No improvements to existing access or additional access route to the spillway are recommended at this time.

F. Access to Dike - Downstream Toe and Crest

14. Existing Access. The crest of the railroad dike is traversed by a gravel service road in poor condition. The low height of the dike embankment allows the downstream toe, along the railroad bed, to be reached from the crest service road. Two small diversion dikes and a diversion ditch are located east of the railroad dike. These features, which require periodic maintenance, can be access by personnel with hand equipment or by light equipment from Greystone Road and an existing gravel driveway.

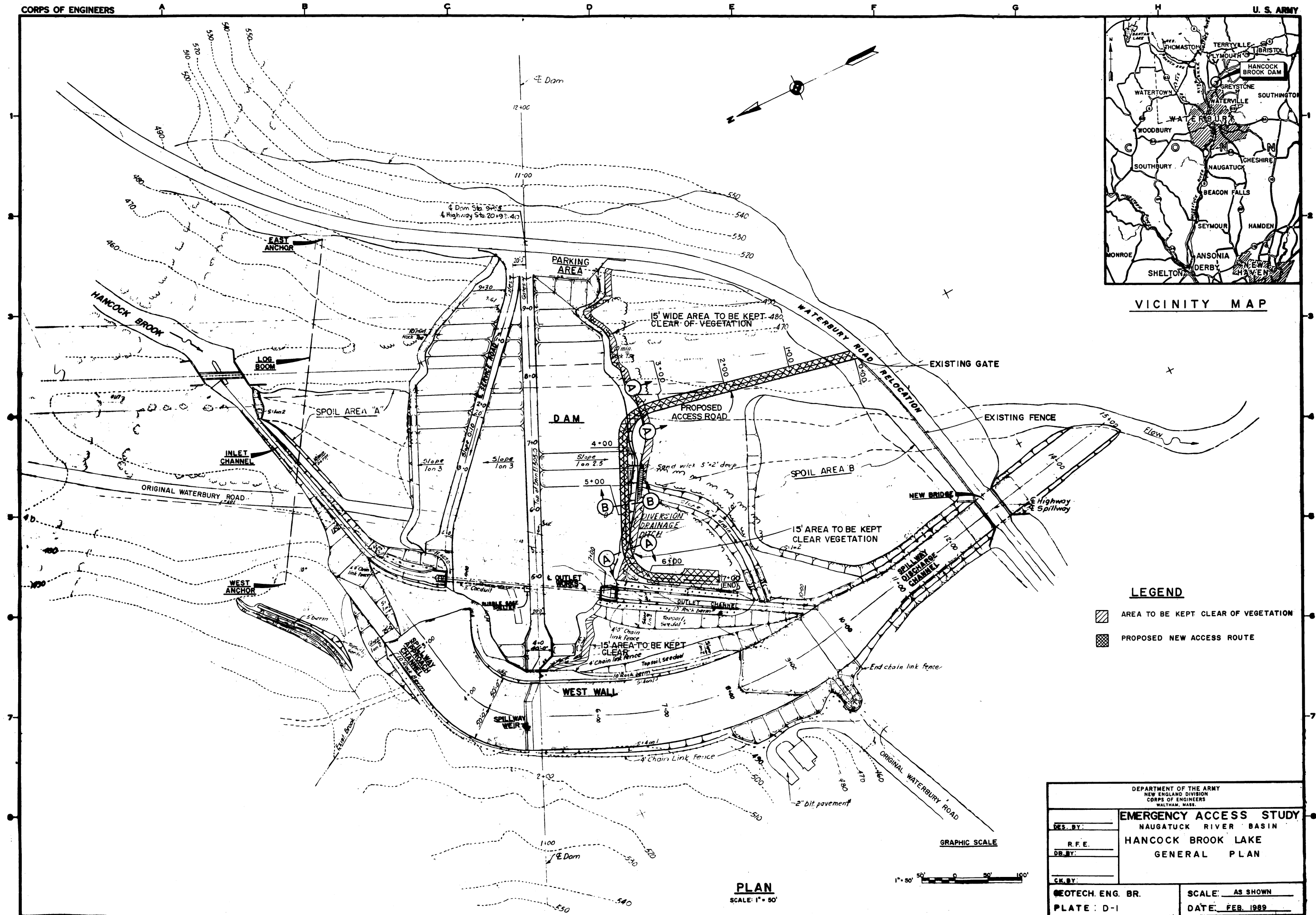
15. Adequacy of Access. Access to the crest and the downstream toe of the railroad dike is considered adequate at this time. Existing access to the diversion dikes and the diversion ditch is considered adequate at this time.

16. Recommended Improvements. The crest service road of the dike is in poor condition with many depressions which results in puddling during rainstorms. The crest road should be improved by adding gravel fill where needed and regrading to the design crest detail. This work should be accomplished through the normal operation and maintenance program for this project, no cost estimate for this work is included.

G. Cost Estimate



Access Road: Downstream Toe of Dam:

<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	JOB	LS	2,000.00
Clearing	1	JOB	LS	1,000.00
Stripping	150	cu. yd.	10.00	1,500.00
Gravel fill	200	cu. yd.	20.00	4,000.00
Crushed stone	55	cu. yd.	25.00	1,375.00
Rock Fill	310	cu. yd.	45.00	13,950.00
			Subtotal	22,825.00
			Contingency 10%	<u>2,282.50</u>
			TOTAL	25,107.50
			SAY	25,000.00



VICINITY MAP

LEGEND

-  AREA TO BE KEPT CLEAR OF VEGETATION
-  PROPOSED NEW ACCESS ROUTE

GRAPHIC SCALE

PLAN
SCALE: 1" = 50'

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
DES. BY: _____	
R.F.E. _____	
DR. BY: _____	
CHK. BY: _____	
GEOTECH. ENG. BR.	
SCALE: AS SHOWN	
PLATE: D-1	DATE: FEB. 1989

APPENDIX E
HOP BROOK LAKE

APPENDIX E
HOP BROOK LAKE

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Subject</u>	<u>Page No.</u>
1.	A. Pertinent Data	E-1
	B. Access to Downstream Toe	
2.	Existing Access	E-2
3.	Adequacy of Access	E-2
4.	Recommended Improvements	E-2
	C. Access to Crest of Dam	
5.	Existing Access	E-2
6.	Adequacy of Access	E-3
7.	Recommended Improvements	E-3
	D. Access to Outlet Works - Channel and Tower	
8.	Existing Access	E-3
9.	Adequacy of Access	E-3
10.	Recommended Improvements	E-3
	E. Access to Spillway - Channel and Weir	
11 .	Existing Access	E-3
12.	Adequacy of Access	E-3
13.	Recommended Improvements	E-3
	F. Access to Dike - Downstream Toe and Crest	
14.	Existing Access	E-3
15.	Adequacy of Access	E-4
16.	Recommended Improvements	E-4
17.	G. Cost Estimates	E-4

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
E-1	Hop Brook Lake Dam - General Plan
E-2	Hop Brook Lake Dam - Sections and Profile

APPENDIX E
HOP BROOK LAKE

A. PERTINENT DATA

1. Pertinent Data.

LOCATION: Hop Brook Lake is located on Hop Brook in the city of Waterbury and towns of Middlebury and Naugatuck in New Haven County, Connecticut. The dam is located about 1.4 miles above of the confluence of Hop Brook and the Naugatuck River.

CONSTRUCTION PERIOD: December 1965 through December 1968.

PURPOSE: Flood control. Although not specifically authorized, recreational facilities are also provided.

RESERVOIR:

Drainage Area: 16.4 square miles
Operating Levels:

<u>Pool</u>	<u>Elevation (NGVD)</u>	<u>Area (acres)</u>	<u>Cumulative Capacity (acre-feet)</u>
Inlet	292.0	—	—
Permanent	310.0	21	120
Flood Control (Spillway Crest)	364.0	270	6,970

DAM:

Type: Rolled earth w/rock protection
Maximum Height (ft): 97
Length (ft): 520
Top Elevation (NGVD): 381

DIKE:

Type: Earthfill
Length (ft): 400
Maximum Height (ft): 33
Top Elevation (NGVD): 381.0

SPILLWAY:

Location: Saddle 1,000 ft east of dam.
Type: Uncontrolled, broad crested weir, chute spillway in rock
Crest Length (ft): 200
Crest Elevation (NGVD): 364.0
Maximum Discharge Capacity (CFS): 23,000

OUTLET WORKS:

Type:	Rectangular conduit
Size:	3' x 5'
Length (ft):	425
Gates:	(2) 3'-0" wide x 4'-0" high hydraulic slide
Discharge at Spillway Crest (CFS):	600
Stilling Basin:	31'-6" x 14'-0" wide, baffle blocks and end still

B. Access to Downstream Toe of Dam.

2. Existing Access. The downstream toe from station 6+30 to the left abutment can be reached from an existing gravel road in fair condition which extends from the crest service road rotary at the left abutment of the dam to the railroad embankment downstream of the dam. The toe in the vicinity of station 3+00 can also be reached from the downstream portion of the original Route 63 (Church Street), however, this requires the temporary removal of the guard rail along relocated Route 63. The remainder of the downstream toe is inaccessible to emergency equipment other than by lowering the equipment down the face of the dam.

3. Adequacy of Access. Access to the downstream toe, except for the two limited reaches described above, is considered inadequate, and improvements must be made.

4. Recommended Improvements. Both the downstream left and right abutments are too steep to accommodate access routes directly from the crest of the dam to the downstream toe. The proposed access route shown on Plate E-1 incorporates proposed stabilization plans for the existing railroad embankment downstream of the dam. The access road begins at the rotary of the crest service road at the left abutment and follows an existing gravel road to the abandoned railroad embankment at about road Station 4+25. The existing gravel road is in poor to fair condition and will require minor gravel fill and grading. The alignment follows the top (centerline) of the railroad embankment to about Station 4+90. At Station 4+90 it is proposed that the railroad embankment be cut on a 1V on 5H slope from about elevation 367 to elevation 330. The access road will follow the downstream edge of the cut from Station 4+90 to about station 6+90. The centerline grade over the reach from Station 4+90 to Station 6+90 is about 17 percent. From Station 6+90 to Station 9+50, at the side of the original Route 63, the access road is level at elevation 330 along the downstream side of the excavated portion of the railroad embankment. At the original Route 63 roadway, the access road turns toward the dam and follows roughly the alignment of the original Route 63 to Station 10+50. From Station 10+50 to about Station 13+00, the access road consists of a 12 foot wide horizontal cut into the slope between the dam and railroad embankments. The cut slope is protected with a non-woven filter fabric, a 6 inch layer of 3/4-inch crushed stone bedding, and an 18 inch layer of stone slope protection to allow safe breakout of groundwater on the cut slope above the roadway. A drainage ditch is provided along the left side of the roadway to collect surface runoff and groundwater

seepage through the cut slope. A culvert will be required at about Station 13+00 to carry water from the surface trench on the uphill side of the roadway, below the access road to the river side. The culvert will be 18-inch BCCMP. From Station 13+00 to the end at Station 13+80, the access road is a crushed stone fill section constructed with 3/4-inch crushed stone. Centerline grades at the cut slope of the railroad embankment and between the dam and the railroad embankment are approximately 17 percent. These grades, higher than the stated design criteria, are considered justified based on the limits imposed by the topography, depth to bedrock, location of the existing tunnel, and other considerations.

C. Access to Crest of Dam

5. Existing Access. The crest of the dam is traversed by a paved service road in good condition from the relocated Route 63. The upper portion of the upstream slope can be reached by a crane on the crest service road, and during normal reservoir conditions, the upstream slope can be crossed on a berm at elevation 314 which leads from the upstream portion of the original Route 63 to the control tower.

6. Adequacy of Access. Access to the crest of the dam and the upstream slope is considered adequate.

7. Recommended Improvements. No improvements to existing access or additional access routes to the crest of the dam or upstream slope are recommended at this time.

D. Access to Outlet Works - Channel and Tower

8. Existing Access. Access to the control tower is achieved by a service bridge between the crest service road and the tower. The inlet channel and the base of the control tower can be reached from the berm that extends from the upstream side of the original Route 63 to the inlet channel. The outlet channel and outlet structure are inaccessible to emergency equipment other than by lowering the equipment down the face of the dam from the crest.

9. Adequacy of Access. Access to the control tower and inlet channel is considered adequate at this time. Access to the outlet channel is considered inadequate.

10. Recommended Improvements. Construction of the access road to the downstream toe of the dam, as outlined in paragraph 4 above and shown on Plate No. E-1, will provide the required access to the outlet channel and outlet structure.

E. Access to Spillway - Channel and Weir

11. Existing Access. Access to the spillway and weir can be achieved by a number of gravel roads which extend from Bristol Street into the approach channel when the approach channel is dry. The spillway can also

be reached from a gravel road along the centerline alignment of the abandoned railroad embankment (see Plate No. E-1). It is believed that a failure of the slopes of the spillway walls would not cause a significant decrease in the capacity of the spillway due to the extreme width of the channel relative to the depth.

12. Adequacy of Access. Access to the spillway and weir is considered adequate at this time.

13. Recommended Improvements. No additional access routes to the spillway are recommended at this time. Minor improvements to the roads to the approach channel, including regrading and addition of gravel fill where needed, should be made at the project manager's discretion through normal operation and maintenance.

F. Access to Dike - Downstream Toe and Crest

14. Existing Access. A gravel service road in good condition traverses the crest of the dike. This service road is reached by an existing gravel road from Bristol Street which is in fair condition. The existing gravel road from Bristol Street to the dike crosses land not owned by the government, a distance of about 300 feet. The height of the dike is such that the downstream toe can be reached by a crane positioned on the crest service road. Minor vegetation grows along the downstream toe which makes inspection difficult.

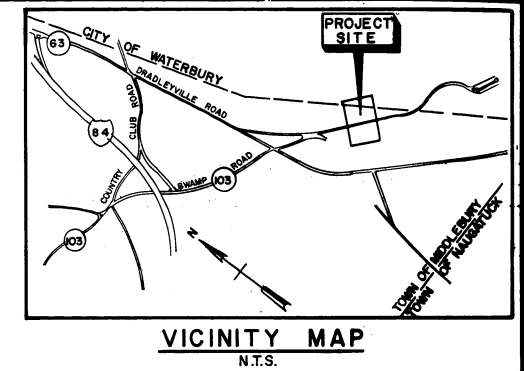
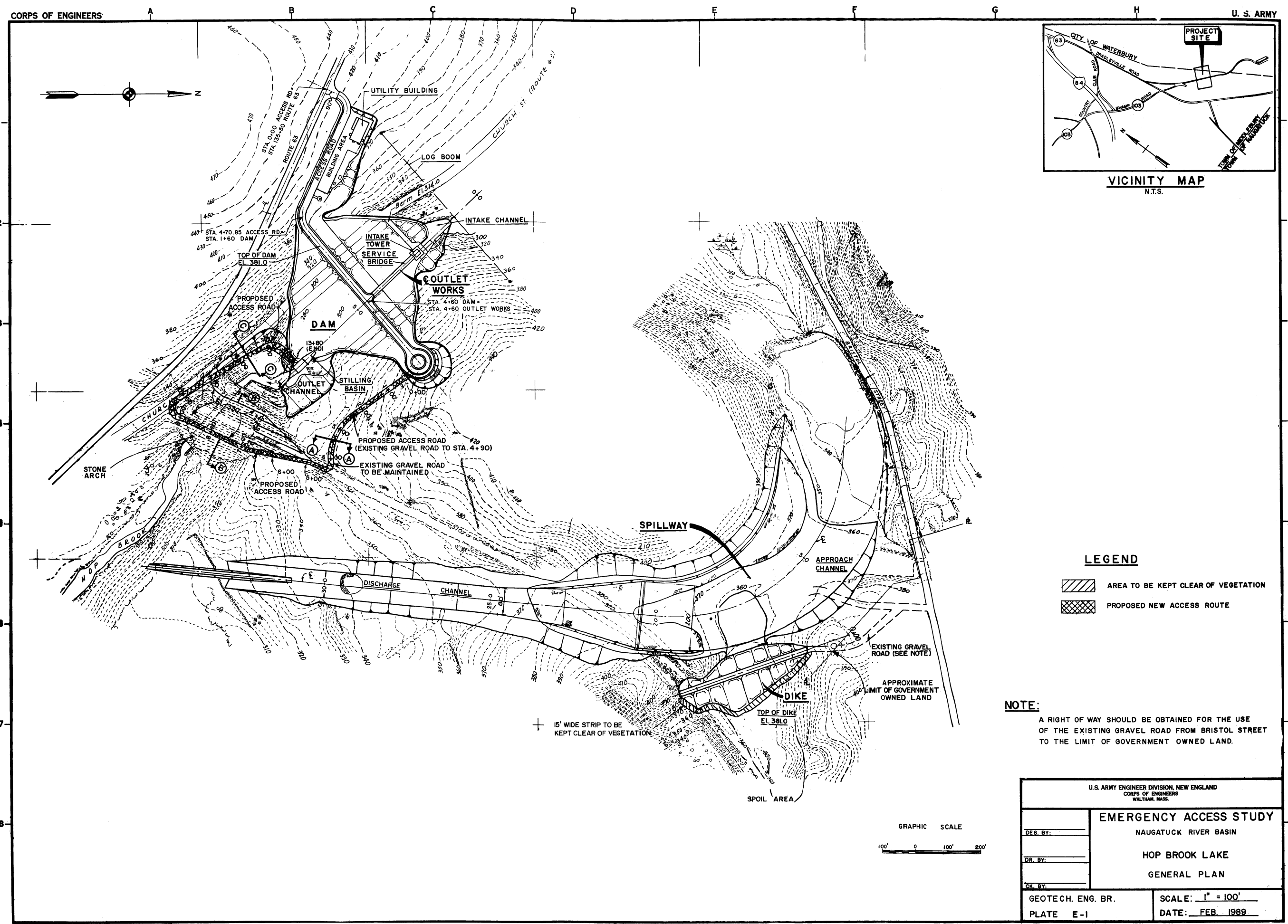
15. Adequacy of Access. Access to the crest and downstream toe of the dike is considered adequate, however, to reach the dike, equipment must pass over privately owned land.

16. Recommended Improvements. A right of way should be obtained for the use of the existing gravel road from Bristol Street to the limit of government owned property north of the dike, (see Plate No. E-1). No additional access routes to the dike are recommended at this time. A 15 foot wide strip should be kept clear of vegetation along the downstream toe of the dike as part of normal operation and maintenance procedures.

G. Cost Estimate

Access Road to Downstream Toe:

<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	JOB	LS	5,000.00
Clearing	1	JOB	LS	5,000.00
Excavation	33,200	cu. yd.	6.00	199,200.00
Topsoil and Seed	6,100	sq. yd.	10.00	61,000.00
Gravel Fill	240	cu. yd.	20.00	4,800.00
Culvert (18" BCCMP)	25	lf.	20.00	500.00
Crushed Stone	450	cu. yd.	25.00	11,250.00
Catch Basin	1	JOB	LS	600.00
Stone Protection	440	cu. yd.	45.00	19,800.00
Filter Fabric	910	sq. yd.	5.00	<u>4,550.00</u>
Subtotal				311,700.00
Contingency 10%				<u>31,170.00</u>
TOTAL				342,870.00
SAY				343,000.00

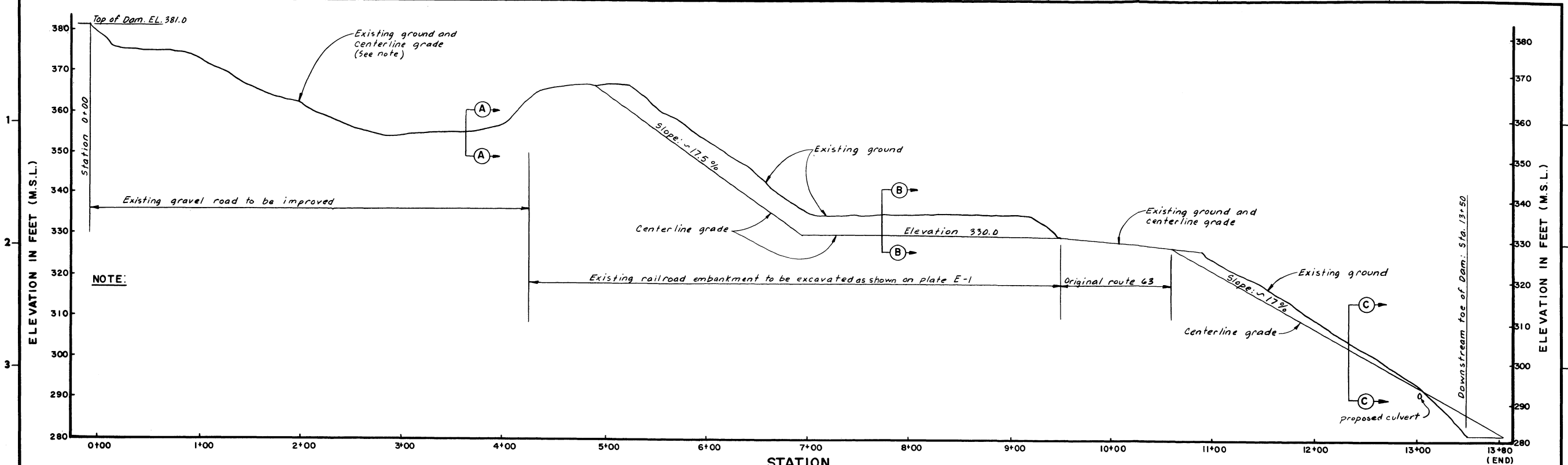


LEGEND

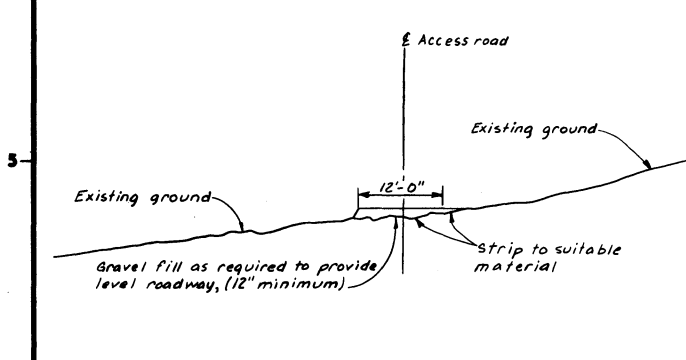
- AREA TO BE KEPT CLEAR OF VEGETATION
- PROPOSED NEW ACCESS ROUTE

NOTE:
A RIGHT OF WAY SHOULD BE OBTAINED FOR THE USE OF THE EXISTING GRAVEL ROAD FROM BRISTOL STREET TO THE LIMIT OF GOVERNMENT OWNED LAND.

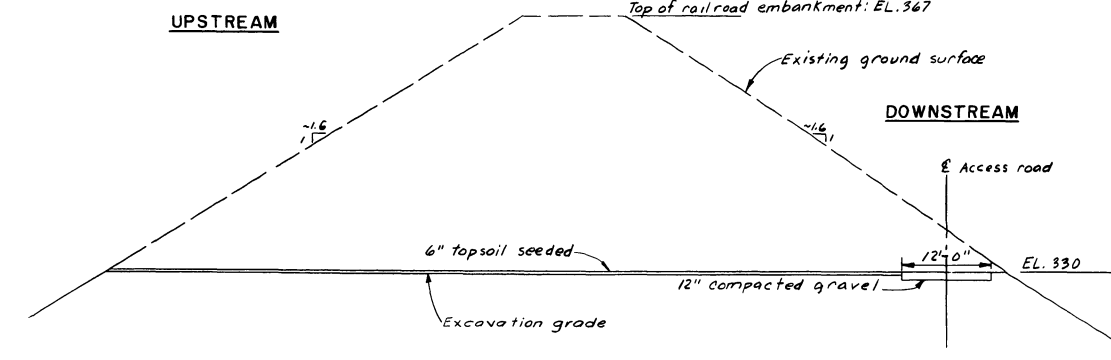
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
EMERGENCY ACCESS STUDY	
NAUGATUCK RIVER BASIN	
HOP BROOK LAKE	
GENERAL PLAN	
DES. BY:	
DR. BY:	
CK. BY:	
GEOTECH. ENG. BR.	SCALE: 1" = 100'
PLATE E-1	DATE: FEB. 1989



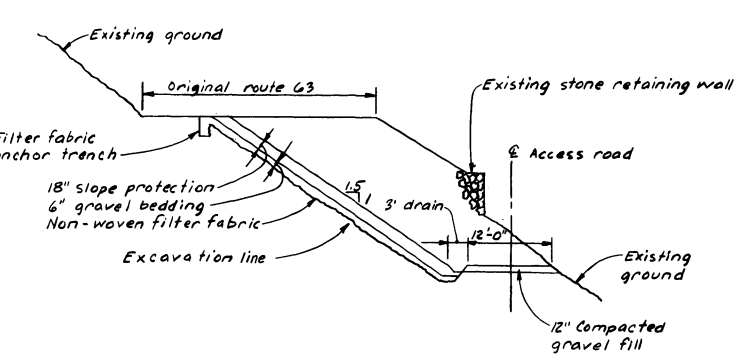
STATION
PROFILE - ACCESS ROAD
 SCALE: HORIZ: 1" = 40'
 VERT: 1" = 10'



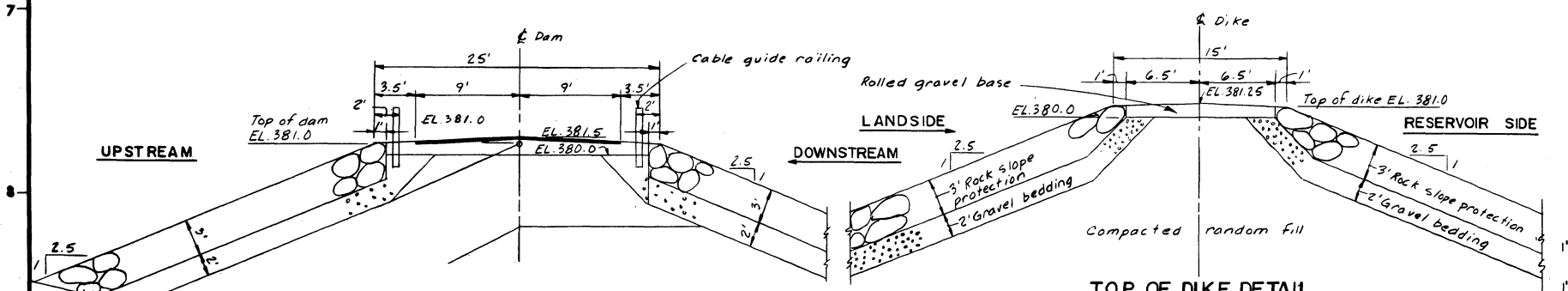
SECTION A-A
 TYPICAL FROM STA. 0+00 TO 5+35
 SCALE: 1" = 10'



SECTION B-B
 TYPICAL FROM STA. 6+90 TO 9+50
 SCALE: 1" = 10'

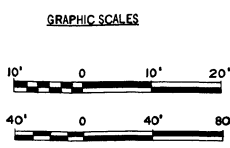


SECTION C-C
 TYPICAL FROM STA. 10+50 TO 13+00
 SCALE: 1" = 10'



TOP OF DAM DETAILS
 N.T.S.

TOP OF DIKE DETAIL
 N.T.S.



DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
EMERGENCY ACCESS STUDY NAUGATUCK RIVER BASIN HOP BROOK LAKE SECTIONS AND PROFILES	
DES. BY: _____ R.F.E. DR. BY: _____ CK. BY: _____	SCALE: AS SHOWN DATE: FEB. 1989
GEOTECH. ENG. BR. PLATE: E-2	

APPENDIX F

NORTHFIELD BROOK LAKE

APPENDIX F
NORTHFIELD BROOK LAKE

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Subject</u>	<u>Page No.</u>
1.	A. Pertinent Data	F-1
	B. Access to Downstream Toe	
2.	Existing Access	F-2
3.	Adequacy of Access	F-2
4.	Recommended Improvements	F-2
	C. Access to Crest of Dam	
5.	Existing Access	F-2
6.	Adequacy of Access	F-2
7.	Recommended Improvements	F-2
	D. Access to Outlet Works	
8.	Existing Access	F-3
9.	Adequacy of Access	F-3
10.	Recommended Improvements	F-3
	E. Access to Spillway - Channel and Weir	
11.	Existing Access	F-3
12.	Adequacy of Access	F-3
13.	Recommended Improvements	F-3
	F. Cost Estimates	F-3

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
F-1	Northfield Brook Lake - General Plan
F-2	Northfield Brook Lake - Sections and Profile

APPENDIX F
NORTHFIELD BROOK LAKE

A. PERTINENT DATA

1. Pertinent Data.

LOCATION: The project is on Northfield Brook about 1.3 miles upstream from its confluence with the Naugatuck River, in the town of Thomaston, Litchfield County, Connecticut.

CONSTRUCTION PERIOD: May 1963 through October 1965.

PURPOSE: Northfield Brook Lake is part of the comprehensive plan for flood control in the Naugatuck Valley. The reservoir aids in reducing flood flows in downstream communities along the Naugatuck River. Recreation facilities are also provided.

RESERVOIR:

Drainage Area: 5.7 square miles

Operating Levels:

<u>Pool</u>	<u>Elevation (NGVD)</u>	<u>Area (acres)</u>	<u>Cumulative Capacity (acre-feet)</u>
Invert (Conduit)	476.0	—	—
Recreation	500.0	7	80
Flood Control (Spillway Crest)	576.0	67	2,430

DAM:

Type:	Rolled earth w/rock slope protection, impervious core
Maximum Height (ft):	118
Length (ft):	810
Top Elevation (NGVD):	591.0

SPILLWAY:

Location:	Left abutment
Type:	Uncontrolled, ogee weir and chute spillway in rock
Crest Length (ft):	72
Crest Elevation (NGVD):	576.0
Maximum Discharge Capacity (CFS):	8,800

OUTLET WORKS:

Type:	Circular concrete conduit
Size:	3'-0" diameter
Length (ft):	544
Gates:	(1) 3'-0" x 3'-0" sluice
Discharge at Spillway Crest (CFS):	160
Stilling Basin:	Bedrock channel

B. Access To Downstream Toe of Dam

2. Existing Access. The downstream toe from the outlet works at about station 6+25 to about station 9+25 is accessible from a flat seeded area along the downstream toe which can be reached from the downstream end of Litchfield Road. Litchfield Road passes through the spillway discharge channel, and during spillway discharge of the project design flood the road would be under as much as 1.1 feet of water running at velocities of up to 11 feet per second. The toe from station 9+25 to the spillway at the left abutment is inaccessible to emergency equipment due to slopes of up to 35%. The downstream toe from the right abutment to the outlet works is inaccessible due to steep slopes in excess of 30%.

3. Adequacy of Access. Access to the toe is considered adequate at this time based on the accessibility of the toe after spillway discharge has subsided. Additionally, it would be possible to transport very large excavators weighing in the range of 50 tons across the spillway discharge channel on Litchfield Road during spillway discharge and to lift material across the channel with a crane positioned at the south side of the channel if emergency measures were required during spillway discharge.

4. Recommended Improvements. No improvements to the existing access or additional access routes to the downstream toe are recommended at this time. A 12 foot wide rock fill access road extending from the parking area at the right abutment to the downstream toe as shown on Plate No. F-1 was investigated and determined not to be justified at this time. A cost estimate for this road is included in paragraph F.

C. Access to Crest of Dam

5. Existing Access. The dam is traversed by a gravel crest service road in good condition. The upper portion of the upstream slope can be reached from the crest road. The upstream toe can be accessed by a 12 foot wide berm at elevation 505 which is reached from an upstream service road in fair condition. During flood conditions the upstream toe is inaccessible.

6. Adequacy of Access. Access to the crest of the dam and the upstream slope is considered adequate at this time.

7. Recommended Improvements. No improvements to the existing access or additional access routes to the crest or the upstream slope are recommended at this time.

D. Access to Outlet Works

8. Existing Access. Access to the outlet channel and the outlet structure is provided by an open field along the downstream toe which can be reached from the downstream portion of the original Litchfield Road. The inlet channel and intake structure are accessible from a 12 foot wide berm along the upstream slope which can be reached from an upstream service road in fair condition. During high pool conditions, the inlet channel and the intake structure are inaccessible and spillway discharge may eliminate access to the outlet channel and outlet structure due to the configuration of Litchfield Road and the spillway discharge channel as outlined above. The dam is unregulated and has no control tower.

9. Adequacy of Access. Access to the outlet works, channels and structures, is considered adequate at this time.

10. Recommended Improvements. No improvements to the existing access or additional access routes to the outlet works are recommended at this time.

E. Access to Spillway Channel and Weir

11. Existing Access. Access to the spillway and weir during high pool conditions is limited to the reach of a crane positioned on the crest service road at the right side of the spillway. During low pool conditions, the downstream portion of the discharge channel can be reached from Litchfield Road and the approach channel is accessible via the berm along the upstream toe from the upstream portion of Litchfield Road.

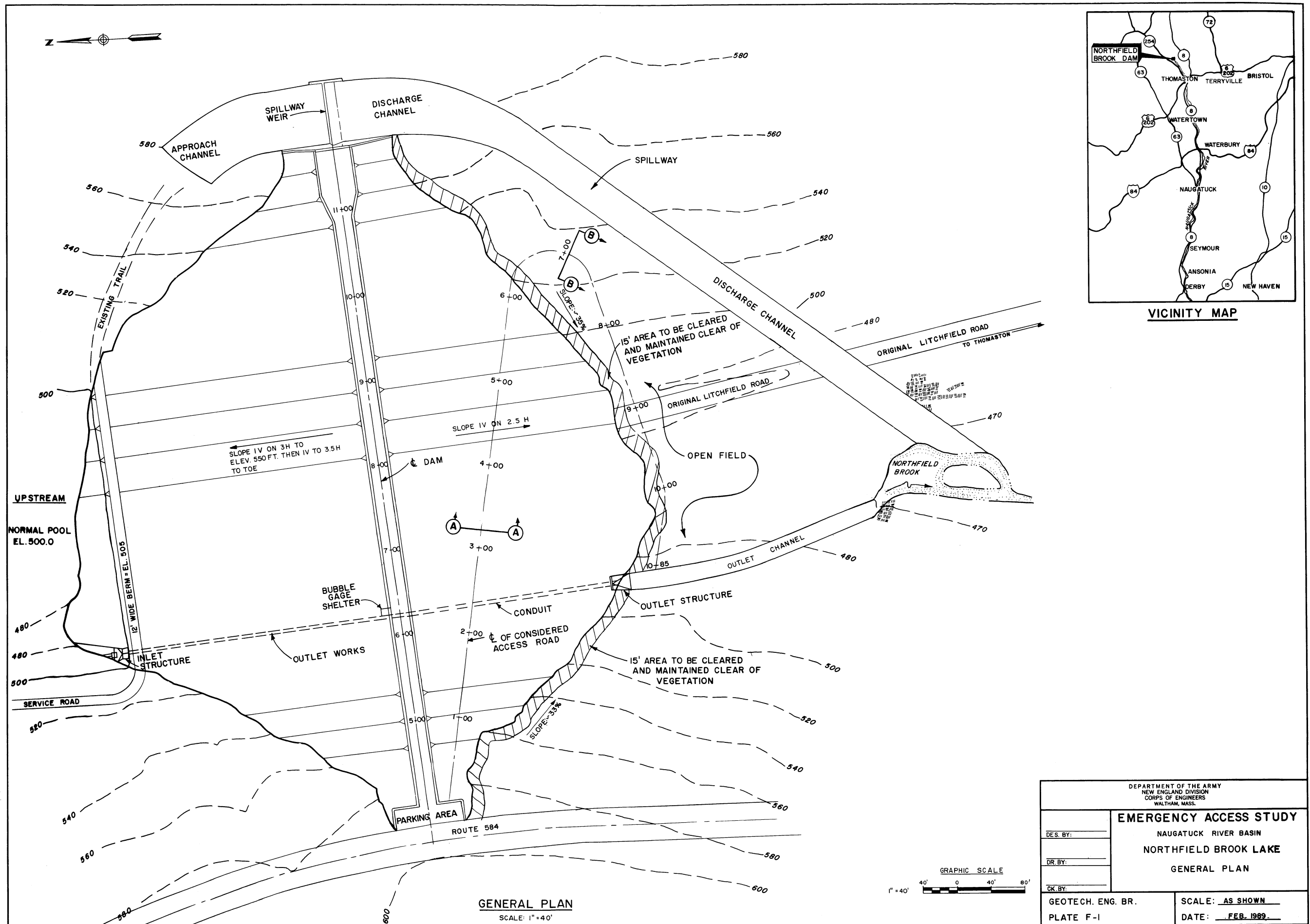
12. Adequacy of Access. Access to the spillway is considered adequate at this time.

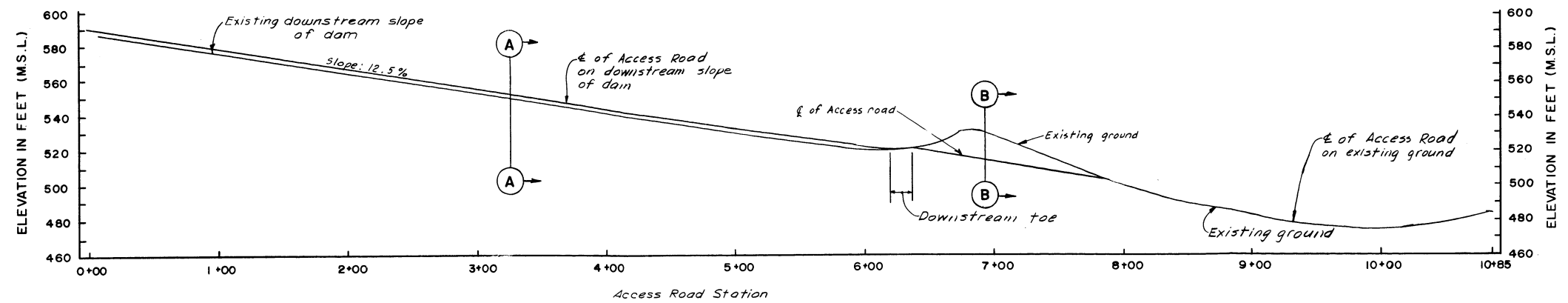
13. Recommended Improvements. No improvements to the existing access or additional access routes are recommended at this time.

F. Cost Estimates

Considered Access Road to Downstream Toe:

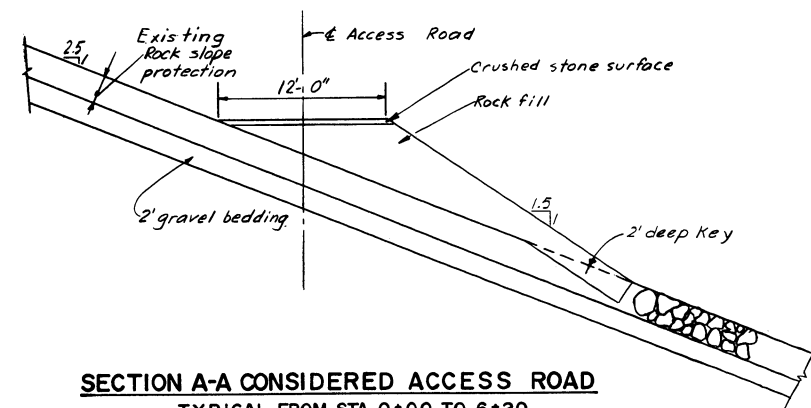
<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	JOB	LS	2,000.00
Excav. - Rock	1250	cu. yd.	40.00	5,000.00
Gravel fill	100	cu. yd.	20.00	2,000.00
Crushed stone	140	cu. yd.	25.00	3,500.00
Rock Fill	2320	cu. yd.	45.00	104,400.00
Subtotal				116,500.00
Contingency 10%				11,650.00
TOTAL				128,150.00
SAY				130,000.00





PROFILE - CONSIDERED ACCESS ROAD

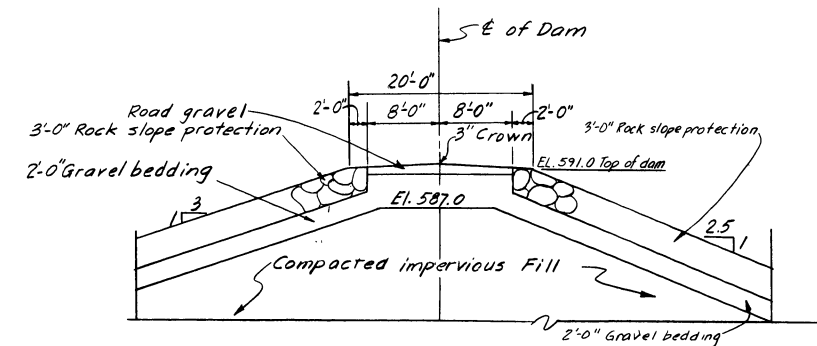
SCALE: HOR. 1" = 40'
VERT. 1" = 30'



SECTION A-A CONSIDERED ACCESS ROAD

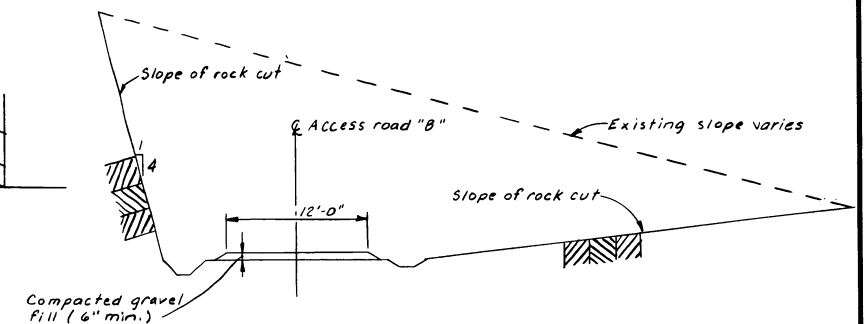
TYPICAL FROM STA. 0+00 TO 6+20

SCALE: 1" = 5'



DETAIL - TOP OF DAM

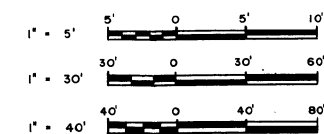
N.T.S.



SECTION B-B CONSIDERED ACCESS ROAD

TYPICAL STA. 6+35 TO 7+85

SCALE: 1" = 5'



DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
DES. BY:	EMERGENCY ACCESS STUDY
A.W.C.	NAUGATUCK RIVER BASIN
DR. BY:	NORTHFIELD BROOK LAKE
CK. BY:	SECTIONS AND PROFILE
GEOTECH. ENG. BR.	SCALE: AS SHOWN
PLATE: F - 2	DATE: FEB. 1989

APPENDIX G
THOMASTON DAM

APPENDIX G
THOMASTON DAM

TABLE OF CONTENTS

<u>Paragraph No.</u>	<u>Subject</u>	<u>Page No.</u>
1.	A. Pertinent Data	G-1
	B. Access to Downstream Toe	
2.	Existing Access	G-2
3.	Adequacy of Access	G-2
4.	Recommended Improvements	G-2
	C. Access to Crest of Dam	
5.	Existing Access	G-2
6.	Adequacy of Access	G-2
7.	Recommended Improvements	G-2
	D. Access to Outlet Works - Channel and Tower	
8.	Existing Access	G-2
9.	Adequacy of Access	G-3
10.	Recommended Improvements	G-3
	E. Access to Spillway - Channel and Weir	
11.	Existing Access	G-3
12.	Adequacy of Access	G-3
13.	Recommended Improvements	G-3
	F. Cost Estimate	G-4

LIST OF PLATES

<u>Plate No.</u>	<u>Title</u>
G-1	Thomaston Dam - General Plan
G-2	Thomaston Dam - Sections and Profile

APPENDIX G
THOMASTON DAM

A. PERTINENT DATA

1. Pertinent Data.

LOCATION: The dam is on the Naugatuck River about 30.4 miles above its confluence with the Housatonic River about 1.6 miles above Thomaston, Connecticut. The project is located in the towns of Thomaston, Litchfield, Harwinton, and Plymouth in Litchfield County, Connecticut.

CONSTRUCTION PERIOD: May 1958 through November 1960.

PURPOSE: The project provides for flood control.

RESERVOIR:

Drainage Area: 97.2 square miles
Operating Levels:

<u>Pool</u>	<u>Elevation (NGVD)</u>	<u>Area (acres)</u>	<u>Capacity (acre-feet)</u>
Invert	380.0	—	—
Flood Control (Spillway Crest)	494.0	960	42,000

DAM:

Type: Rolled earth w/rock protection
Maximum Height (ft): 142
Length (ft): 2000
Top Elevation (NGVD): 517.0

SPILLWAY:

Location: Left-east abutment
Type: Uncontrolled, side channel
spillway in rock
Crest Length (ft): 435
Crest Elevation (NGVD): 494.0
Maximum Discharge Capacity (CFS): 132,200

OUTLET WORKS:

Type: Horseshoe conduit
Size: 10'-0" diameter
Length (ft): 455
Gates: (2) 5'-8" x 10'-0"
hydraulic slide
Discharge at Spillway Crest (CFS): 5,800
Stilling Basin: Bedrock channel

B. Access to Downstream Toe of Dam

2. Existing Access. The downstream toe, from the right abutment to about station 8+00, is presently inaccessible to construction equipment. A remedial subdrain and stone blanket run along the toe from about station 7+00 to about station 11+00. The stone blanket, from station 8+00 to about station 10+25 can be reached by an open area adjacent to an existing gravel road leading from Route 8, downstream of the dam, to a U. S. Army Corps of Engineers water quality station at the outlet channel. Approximately 75 feet of the existing gravel road from Route 8 to the water quality station passes over private property, (see Plate No. G-1). The toe can not be reached from the stone blanket at station 11+00 to the outlet works at about station 15+00 due to slopes of about 20% along the toe. The toe is also inaccessible from the outlet works to the spillway, a length of about 450 feet.

3. Adequacy of Access. Access to the downstream toe between the stone blanket and the outlet works and from the outlet works to the spillway is considered inadequate at this time.

4. Recommended Improvements. The construction of a gravel access road from the existing road to the water quality station to a turn around adjacent to the right side of the outlet works will provide access to a 15 foot cleared strip along the toe between the stone blanket at station 11+00 and the outlet works. This route will also provide access to the presently inaccessible outlet structure. A right of way should be obtained for the use of the 75 foot reach of the existing gravel road from Route 8 to the limit of government owned property downstream of the dam, (see Plate No. G-1). The improvement of an existing gravel access road leading from the relocated Hill Road to the lower end of the spillway discharge channel to the downstream toe of the dam between the outlet works and the spillway will allow access to the cleared strip which is maintained along this reach of the toe provided there is no spillway discharge. The length of the reach requiring improvement is about 700 feet. Construction of the access routes to the right side of the outlet works is given moderate priority and improvements to the existing road to the downstream toe between the outlet works and the spillway is given low priority.

C. Access to Crest of Dam

5. Existing Access. The crest of the dam is traversed by a bituminous concrete service road in good condition. The upper portions of the upstream slope can be reached by a crane on the crest service road. The upstream slope can also be accessed by a number of gravel roads and open seeded areas along the upstream toe during low pool conditions (see Plate No. G-1).

6. Adequacy of Access. Access to the crest of dam is considered adequate at this time.

7. Recommended Improvements. No improvements to the existing access or additional access routes to the crest of the dam are recommended at this time.

D. Access to Outlet Work - Channel and Tower

8. Existing Access. The inlet channel is a shallow earth cut channel with a length of about 150 feet. The channel is in an open field which can be reached by a paved service road from the relocated Blakeman Road which is in good condition (see Plate No. G-1). The control tower can be reached by the service bridge from the crest service road and the base of the tower can be reached during low pool conditions by the paved service road. Access to the outlet channel is limited to a gravel road in fair condition leading from an existing paved road downstream of the dam, across a drainage ditch, to a water quality station located on the right side of the outlet channel about 375 feet below the outlet structure. The existing road to the water quality station is not suitable for construction equipment. There is presently no access to the outlet structure other than by lowering equipment down the face of the embankment.

9. Adequacy of Access. Access to the outlet channel is considered inadequate and should be improved. The high rock cut at the right side of the outlet channel could potentially cause a significant blockage of the channel should a failure occur. Access to the inlet channel and the control tower is considered adequate at this time.

10. Recommended Improvements. A gravel access road from the existing road to the water quality station to a turnaround above the left side of the outlet structure, as shown on Plate No. G-1, will allow for adequate access to the outlet channel and the outlet structure, details of this road are shown on Plate G-2. The existing road to the water quality station should be improved under normal maintenance procedures. Improvement of this route is expected to be performed by project personnel and a cost estimate for this work is not included. No improvements to the existing access or additional access routes to the inlet channel or control tower are recommended at this time.

E. Access to Spillway and Weir

11. Existing Access. Access to the spillway during spillway discharge is limited to the reach of a crane on the spillway bridge of the crest service road. There is no defined approach channel and no possibility of a blockage upstream of the spillway weir. The discharge channel can be reached after spillway discharge has stopped from an existing access road from Blakeman Road which has been used for remedial work in the discharge channel in the past.

12. Adequacy of Access. Access to the spillway and weir is considered adequate at this time.

13. Recommended Improvements. No improvements to the existing access or additional access routes to the spillway are recommended at this time.

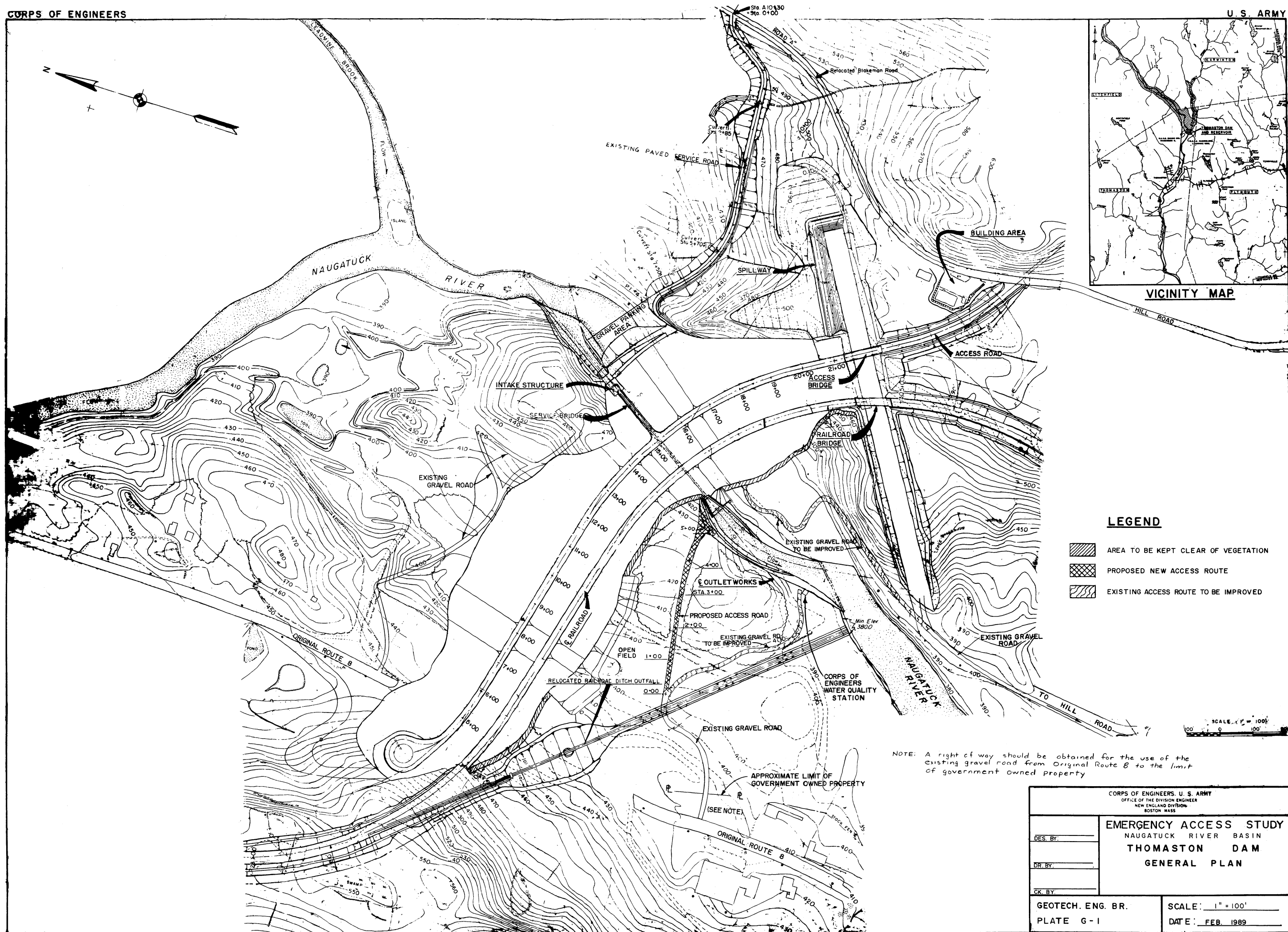
F. Cost Estimates

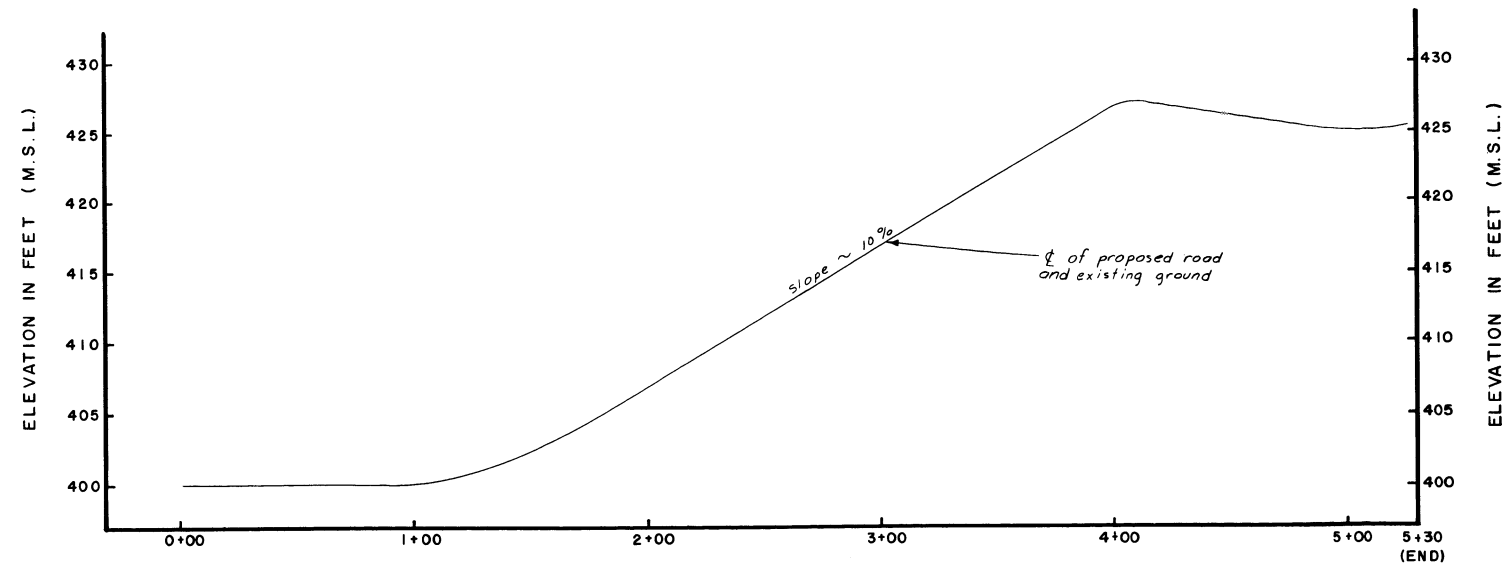
Access Road to Outlet Channel:

<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Mob-demob	1	JOB	LS	2,000.00
Clearing	1	JOB	LS	2,000.00
Stripping	370	cu. yd.	10.00	3,700.00
Gravel fill	370	cu. yd.	20.00	7,400.00
Subtotal				15,100.00
Contingency 10%				<u>1,510.00</u>
TOTAL				16,610.00
SAY				17,000.00

Improvements to Existing Road to Toe:

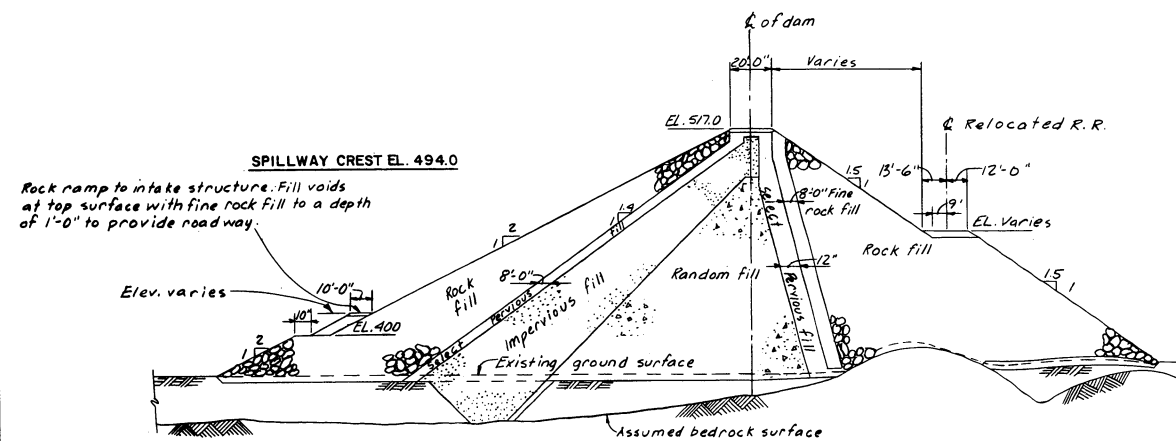
<u>Item</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost (\$)</u>
Gravel fill	100	cu. yd.	20.00	2,000.00
Grading	1	JOB	LS	1,000.00
Subtotal				3,000.00
Contingency 10%				<u>300.00</u>
TOTAL				3,300.00



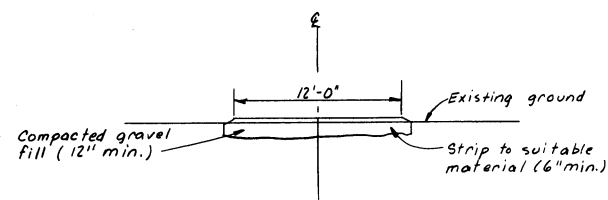


℄ PROFILE - PROPOSED ACCESS ROAD

SCALE : HOR. 1" = 30'
VERT. 1" = 5'



SECTION - STA. 16+00
TYPICAL FROM STA. 15+25 TO STA. 17+00



TYPICAL SECTION
PROPOSED ACCESS ROAD
SCALE: 1" = 5'

DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
EMERGENCY ACCESS STUDY NAUGATUCK RIVER BASIN THOMASTON DAM SECTIONS AND PROFILE	
DES. BY. _____	
R.F.E. _____	
DR. BY. _____	
CHK. BY. _____	
GEOTECH. ENG. BR.	SCALE: AS SHOWN
PLATE G-2	DATE: FEB. 1989

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

TO	DAEN-ECE-B ECE-G ECE	FROM	DAEN-ECE-B/G	DATE	5 November 1984	CMT 1
R: ENCE OR OFFICE SYMBOL DAEN-ECE-B		SUBJECT Trip Report - NED Office Visit and Dam Site Inspections (22-25 October 1984)				

1. Purpose. To discuss design efforts for remedial measures being accomplished for North Springfield, Thomaston, and Townshend dams in Vermont. Also to investigate the work being done at North Hartland and Deweys Mills Dams regarding the installation of non-Federal hydropower.

2. Attendance. Those in attendance at the office meeting were as follows:

Charlie Tiersch (NED)
Toni Mancini (NED)
Tim Boshman (NED)
John Hart (NED)
Richard Reardon (Part Time) (NED)
Art Walz (DAEN-ECE-G)
Pete Hart (DAEN-ECE-G)
Philip Brown (DAEN-ECE-B)

3. Narrative. Five dam sites were visited and a discussion of each follows:

a. Townshend Dam. This project is located on the West River in Vermont. It utilized about 67 percent of its storage capacity during high rainfall in May 1984. A head of 78 feet was created which resulted in seepage from the foundation (2.5 cfs) and a quick condition in an area at the junction of the downstream toe and right abutment. Remedial work was accomplished in this same area in 1970 to correct a seepage condition from a high pool in April 1969. The Division plans to install additional instrumentation, relief wells with a discharge below ground surface, and extend the filter placed in 1970. These measures are considered appropriate.

b. North Springfield Dam. This project is located on the Black River in Vermont. It utilized 67 percent of its storage in May 1984 which created a head of 75 feet at the downstream toe. Seepage from the terrace on the right abutment at the junction with the embankment measured about 2.0 cfs, became cloudy, and some piping occurred. Remedial measures were constructed in this area in 1970 as a result of previous seepage. The Division plans exploration, additional instrumentation and an extension of the downstream filter on the right abutment terrace. This is considered appropriate.

c. North Hartland Dam. Non-Federal hydropower is being installed in the existing outlet works. The 16' ϕ pipe through the tunnel to the new downstream control structure, the bifurcation area, and to the power house is complete. The contractor is currently working on the concrete power house with construction scheduled to be completed in May 1985.

5 November 1984

SUBJECT: Trip Report - NED Office Visit and Dam Site
Inspections (22-25 October 1984)

d. Dewey's Mills Dam. This dam is in the North Hartland pool acquired by the Corps when North Hartland Dam was constructed. A non-Federal hydropower unit is currently being installed by Hydro Energies Corporation (HEC) of Boston. Upstream and downstream cofferdams have been constructed diverting flow around the area where the powerhouse will go. Blasting for the powerhouse and outlet channel is completed. The contractor was working on the powerhouse foundation when we were there. Construction is scheduled to be completed in FY 85.

e. Ball Mountain Dam. During the course of the trip an inspection was made of a small bulge in the downstream slope and differential settlements in the crest of Ball Mountain Dam on the West River in Vermont. Ball Mountain is an earth and rockfill dam located in a steep narrow valley, having a maximum height of 265 feet with 1V on 2.5H upstream slope and a very steep 1V on 1.75H downstream slope. The project was completed in November 1961 and to date there have been 3 periodic inspections (March 1975, July 1979, August 1984).

The bulge in the downstream slope extends over the entire length of the embankment. Settlement along the top of dam is on the order of 18-24 inches with all visible indications of a slide. In the center of the embankment the movement has occurred in an area along the downstream edge of the crown, which indicates a shallow surficial movement. In the reach adjacent to both abutments the scarp trace is present across the crown and into the upstream slope for several feet which is infringing upon the freeboard. In the past, surface monumentation has been hard to correlate. However, a comparison of photographs indicate that the upstream encroachment in the vicinity of the abutments has occurred between the 1979 and 1984 periodic inspections. It was also noted that the only access to the embankment was through the spillway approach channel.

The Division has a plan to monitor and evaluate the embankment movement in FY 85, by use of monuments and slope indicators. This program should be expanded to include sufficient slope indicators, test pits in the top of dam, exploration and sufficient monuments to locate and define the zone of movement and obtain sufficient data to start the necessary remedial measures.

4. Conclusions and Recommendations. Work should continue as outlined at the exit meeting on 25 October 1984. The following items are offered for appropriate action:

a. The design of the remedial measures for North Springfield, Townshend and Thomaston Dams is on track and should continue as planned. The program for instrumentation of these projects is considered appropriate and should continue as planned.

b. The evaluation of the Ball Mountain embankment should proceed on a timely schedule. Recommend the slope indicators be installed and read by contract while the remainder of the work be accomplished by in-house forces. Monuments should be installed immediately in order to obtain an adequate data base.

DAEN-ECE-B

5 November 1984

SUBJECT: Trip Report - NED Office Visit and Dam Site
Inspections (22-25 October 1984)

c. The dam operating plan for Ball Mountain should be reviewed in light of the embankment condition and limited access, and appropriate modifications initiated.

d. A review of all of the Divisions projects should be made to determine if access is available to all pertinent parts of the project during high reservoir conditions.

AW
ART WALZ
DAEN-ECE-GS

AW
for PETE HART
DAEN-ECE-GG

Phil Brown
PHIL BROWN
DAEN-ECE-B